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ORIGINAL ARTICLE **ÖZGÜN ARAŞTIRMA**

THROMBOLYTIC AND THROMBECTOMY APPLICATIONS IN POSTERIOR CIRCULATION STROKES: DEMOGRAPHY AND PROGNOSIS

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ABSTRACT

INTRODUCTION: To evaluate the data of patients admitted to emergency department of our hospital with acute posterior circulation stroke who underwent intravenous thrombolytic (IVT) and/or mechanical thrombectomy (MT).
METHODS: Twenty-two patients with acute posterior circulation stroke between April 2019 and November 2020 who received IVT and/or MT treatment were included in the study. Our hospital has been serving as a comprehensive stroke center since April 2019.
RESULTS: 55 % (12 M, 10 F) of the patients were male patients, and the average age of all patients was 68 (29-87). 11 of the patients was applied IVT, 3 was IVT+MT and 8 was MT. The mean time between the symptoms onset and their admitting to the emergency service was 95 minutes. The mean time between the door to computerized tomography was 33 minutes, the neurological evaluation to needle time was 73 minutes and to the femoral puncture was 128 minutes. 9% of patients (41%) had mRS≤2 at 3 months, and this was associated with a good prognosis. Due to the fact that our hospital is a pandemic hospital and serves a large group of COVID patients, there have been delays in both imaging and treatment process of acute stroke patients during this period.
DISCUSSION AND CONCLUSION: Posterior circulation infarcts are one fifth of all ischemic strokes, and basilar artery occlusions (BAO) constitute 1%. In our study, the prognosis of 27% of patients resulted in death. Although the male gender was more dominant in these patients and their age was more advanced, statistical significance could not be obtained due to the small number of patients. However, it was determined that the prognosis of cases with high NIHSS at 24th hours and bazilar artery involvement were poor ($p<0.05$).
Keywords: Acute posterior circulation stroke, basilar artery thrombosis, IV tpa, mechanical thrombectomy.

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AKUT ARKA SİSTEM İNMELERİNDE TROMBOLİTİK VE TROMBEKTOMİ UYGULAMALARI: DEMOGRAFİ VE PROGNOZ

ÖZ

GİRİŞ ve AMAÇ: Hastanemiz acil servisine akut arka sistem bulguları (ASİ) ile başvuran intravenöz trombolitik ve/veya mekanik trombektomi uygulanan hastaların verilerini değerlendirmektir.
YÖNTEM ve GEREÇLER: Nisan 2019 ile Kasım 2020 tarihleri arasında hastanemiz acil servisine akut inme ile başvuran intravenöz trombolitik (IVT) ve/veya mekanik trombektomi (MT) tedavisi uygulanan akut arka sistem bulgusu saptanan 22 hasta çalışmaya alındı. Hastanemiz Nisan 2019'dan itibaren kapsamlı inme merkezi olarak hizmet vermektedir.
BULGULAR: Hastaların %55'i (12 E,10 K) erkek hasta olup, tüm hastaların yaş ortalamaları 68'dir (29-87). Hastaların 11'ine IVT, 3'üne IVT + MT, 8'ine sadece MT uygulandı. Hastaların şikayetlerinin başlaması ile acil servise başvuruları arasında geçen süre 95 dk., kapı-BT süresi ortalama 33 dk., nörolojik değerlendirmeden sonra- IVT başlama arasındaki süre ortalama 73 dk, nöroloji doktoru değerlendirmesi kasık iğne zamanı arasındaki süre ortalama 128 dk.dır. Hastanemiz pandemi hastanesi olması ve yoğun bir COVİD hasta grubuna hizmet vermesi nedeni ile bu süreç içinde akut inme hastalarının hem görüntüleme, hem de tedavi süreçlerinde zaman açısından gecikmeler söz konusu olmuştur. Hastaların geliş NIHSS değerleri ortalama 12 idi. Bu değer 24. saatte ortalama 11 olarak saptandı. Taburculuk sırasında ise 5 hasta vefat ettiği için, sağ kalan 17 hastanın ortalama NIHSS ise 5 olarak bulundu. Hastaların 9'unda (%41) 3. ayda mRS≤2 idi ve bu durum iyi fonksiyonel prognoz ile ilişkiliydi. İnme ile ilişkili vefat oranı %27 olarak belirlendi. Dış yoğun bakım ünitesine (YBÜ) sevk edilen hastaların verilerine E-nabız sistemi üzerinden ulaşılmıştır.
TARTIŞMA ve SONUÇ: Tüm iskemik inmelerin beşte birini arka sistem tıkanıklıkları, %1'ini ise baziller arter tıkanıkları (BAT) oluşturmaktadır. MT tedavisinin IVT tedaviler ile beraber uygulanmaya konması arka sistem inmelerinde bağımlılık ve mortalite oranlarında azalma sağlamıştır. Çalışmamızda nadir görülen arka sistem inme hastalarının verileri derlenmiş olup, hastaların %27'sinin prognozu vefat ile sonuçlanmıştır. Bu hastalarda erkek cinsiyetinin daha baskın, yaşları daha ileri olmakla birlikte hasta sayısı az olduğu için istatistiksel anlamlılık elde edilememiştir. Ancak 24. NIHSS yüksek ve baziler arter tutulumu olan vakaların prognozlarının kötü olduğu saptanmıştır ($p<0.05$).

Anahtar Sözcükler: Akut arka sistem inmesi, bazilar arter trombozu, IV tpa, mekanik trombektomi.

INTRODUCTION

One-fifth of all strokes are caused by posterior circulation stroke (PCS). Among these, basilar artery occlusions (BAOs), known for their poor course, account for 1% of strokes in general (1). This rate accounts for 10% of large vessel occlusions (2). Atherosclerosis may develop on the ground of embolism, dissection, or inflammation and has a high mortality rate as known (2,3). Clinical results vary depending on the location of vessel occlusion and the anatomical region affected by ischemia. Posterior circulation stenosis/occlusions may manifest themselves as a transient ischemic attack or severe stroke may develop. The technological developments in the last few decades have made a big difference in both diagnosis and treatment of PCS. For example, the mortality rate decreases 2-fold and the dependency rate decreases 1.5-fold if recanalization is achieved in BAOs (4). The fact that the rate of poor prognosis with conservative treatment in BAOs is 79%, the mortality rate with intravenous thrombolytic therapy (IVT) is 50%, and the dependency rate is 28% indicates the need for other interventions according to studies (5,6).

The fact that this rate remains at 4% with IVT in BAOs supports this need, while it is obvious that the clinical outcome is better with early recanalization (7). Mechanical thrombectomy treatment has recently begun to be commonly used in patients with PCS and especially with BAOs. Mechanical thrombectomy (MT) is characterized by decreased mortality and symptomatic intracranial bleeding rates and high recanalization rates in patients with BAOs compared to intravenous and/or intraarterial thrombolytic treatments (2,8). In this article, we present the data of our patients with PCS who underwent IVT and/or MT in our hospital, which has been serving as a comprehensive stroke center since April 2019.

METHODS

The study was conducted in accordance with the ethical standards of the Declaration of Helsinki. Marmara University Medical Faculty Clinical Research Ethics Committee approved the study (Issue: 09.2019.432, Date: 05.04.2019). Signed

consent was obtained from all cases that they agreed to participate in the study. Patients admitted to the emergency department of our hospital with acute stroke between April 2019 and November 2020 were questioned about the time of onset of symptoms or the patient's most recent well-being with a detailed anamnesis, vital results were recorded, computed tomography (CT), and angiography (CTA) examinations were performed after necessary blood tests and diffusion MRI examination was performed in patients deemed necessary. The data of the patients with PCS who underwent IVT and/or MT treatment were noted as a result of the anamnesis and imaging examinations given. Patients' symptom onset and emergency admission process, door-to-physician examination times, door-to-imaging times, NIHSS (National Institutes of Health Stroke Scale) values, neurological evaluation-to-needle time, neurological evaluation-to-groin puncture time, discharge NIHSS values, and postoperative prognosis were recorded. Referral or death to the intensive care unit was evaluated as poor prognostic factors in the prognosis of the patients.

RESULTS

Of the 238 patients admitted to our hospital with acute stroke between April 2019 and November 2020, 22 (9%) had posterior circulation stroke and 216 (91%) had anterior circulation stroke. A total of 129 patients received IVT treatment (54%), 65 patients received MT (27%), 44 patients received IVT+MT (19%).

Of the 22 patients admitted to the emergency department with acute posterior circulation results, 11 underwent IVT (50%), 8 underwent MT (36%), and 3 underwent IVT+MT (14%).

The comparison of the data of our anterior and posterior circulation strokes was not included in our study, this issue will be discussed in another article.

Demographics: 55% (12 M, 10 F) of patients were male and the mean age of all patients was 68 (29-87). There were 5 male and 6 female patients in the IVT group and their mean age was 62 years; there were 5 male and 3 female patients in the MT group and their mean age was 67 years; there were 2 male patients and 1 female patient in the IVT+MT group and their mean age was 62 years. There was no statistical significance even though the mean age was older in the group undergoing mechanical thrombectomy ($p>0.05$) (Table 1). 64% had a history of hypertension (HT), followed by a history of hyperlipidemia (HL), diabetes (DM), and cardiovascular disease (CVD), respectively when the patients were evaluated in terms of risk factors. Atrial fibrillation (AF) was detected in only 2 patients. However, the advanced cardiac examination could not be performed in many patients because their subsequent follow-up was in the external intensive care unit or their prognosis resulted in death (Table 1).

Table 1. Demographic characteristics and stroke risk factors according to the treatment scheme of the patients.

	IVT	MT	IVT+MT	Total
Number of patients	11 (50%)	8 (36%)	3 (14%)	22
Gender				
Female	6 (27%)	3 (14%)	1 (5%)	10 (45%)
Male	5 (23%)	5 (23%)	2 (%9)	12 (%55)
Age	62±13	67±14	62±29	68±15
Stroke risk factors				
HT	5 (23%)	7 (32%)	2 (9%)	14 (64%)
DM	1 (5%)	4 (18%)	2 (9%)	7 (32%)
HL	4 (18%)	3 (14%)	2 (9%)	9 (41%)
AF	1 (5%)	0	1 (5%)	2 (10%)
Previous stroke	4 (18%)	2 (9%)	0	6 (27%)
CVD	2 (9%)	4 (18%)	1 (5%)	7 (32%)
Smoking	2 (9%)	1 (5%)	1 (5%)	4 (19%)

IVT: İntravenous thrombolysis; MT: mechanical thrombectomy; HT: hypertension; DM: diabetes mellitus; HL: hyperlipidemia; AF: atrial fibrillation; CVD: cardiovascular disease.

Symptom onset and procedure data applied: The time between the onset of the patients' complaints and their admission to the emergency department (except for 2 patients with wake-up stroke) is 95 minutes. Evaluation by the emergency physician takes place within the first 10 minutes. The average duration of door-to-CT is 33 minutes. The mean time between the onset of IVT was 73 minutes after neurological evaluation, and the mean time between the femoral puncture time was 128 minutes after neurologist evaluation (Table 2). These processes are above the times specified in the guidelines. There have been delays in both imaging and treatment processes of acute stroke patients after March 2020, especially after July since our hospital is a pandemic hospital and serves an intense group of COVID patients. Our study, comparing the data of both imaging and treatment durations in the pre-COVID-19 period and in the COVID-19 period was also planned.

Table 2. Symptom onset time and time interval for administered treatments.

Mean (min)	IVT n=11	MT n=8	IVT+MT n=3	Total n=22
Symptom-to-door	74	155	54	95
Door-to-CT	37	29	24	33
Neurology physician evaluation-to-needle	64		119	73
Neurology physician evaluation-to-puncture		96	158	128

IVT: İntravenous thrombolysis; MT: mechanical thrombectomy, CT: computed tomography.

Prognosis with NIHSS and mRS: The mean NIHSS values of a total of 22 patients were 12. The mean of this value was found to be 11 at the 24th hour. 5 patients died and the mean NIHSS of the 17 surviving patients was 5 up to the time of discharge (Table 3). 10 (45%) of the patients were followed up in the stroke unit and the other 12 (55%) patients were followed up in the ICU. The mean NIHSS of 11 patients who received IVT at admission, 24th hour, and at discharge was 10-5 and 3, respectively when each patient group was evaluated separately. One of the patients who received IVT died during follow-up. It was observed that 8 patients who underwent MT had a very high NIHSS by calculating the mean NIHSS was 16 at 18 and 24 hours. Three of these patients died during follow-up. The mean NIHSS of the 3 patients who underwent IVT+MT at admission and 24 hours were 7-12, respectively, and it was noted that these patients had an increase in NIHSS within 24 hours. 1 patient died in this group during follow-up. 50% (11/22) of the patients with mRS:0-2 at discharge had a good functional prognosis.

The first 30-day and 90-day mRSs of the patients were obtained from outpatient follow-ups or telephone interviews with their relatives. There were 7 patients in the IVT group and 2 patients in the MT group with good prognosis indicator mRS:0-2. 2 more patients were found to have died during the 30- and 90-day follow-up period apart from 5 patients who died during hospitalization. However, it was learned that the death cause of one patient was related to ovarian cancer. One of these patients was in the MT group and the other was in the IVT+MT group. 1 of 15 living patients was not written in mRS in Table 3 because he has not yet completed the 30-day period. 6/7 of the deceased patients were in the MT or IVT+MT group only. It was noted that these patients were patients with high NIHSS admission, who still had this elevation at the 24th hour, who applied to Glasgow coma level, and who were older and came with basilar artery thrombosis when the deceased patients were evaluated. Statistical data for these patients are shown in Table 4.

Table 3. Mean NIHSS scores and follow-up mRSs and prognostic evaluations of patients at admission, 24th hour, and discharge.

	IVT	MT	IVT+MT	Total
Application mean NIHSS (N=22)	10	18	7	12
24th hour mean NIHSS (N=22)	5	16	12	11
Discharge mean NIHSS (N=17)	3	7	5	5
Discharge mRS (number of patients)				
mRS:0-2	8	2	1	11
mRS:3-5	3	3	1	7
mRS:6	1	3	1	5
(1-3 months) mRS (number of patients)				
mRS:0-2	7	2		9
mRS:3-5	1	2		3
mRS:6		1	1	2
Basilar thrombosis	2	6	3	11
mRS:6		4	2	6

NIHSS: National Institutes of Health Stroke Scale; mRS: Modified Rankin Scale.

Table 4. Comparison of data of surviving and dying patients.

	Surviving N=15	Dying N=6	P
Age	60±17 (29-87)	70±12 (52-84)	0.217
Gender	M:8 (53.3%) F:7 (46.7%)	M:4 (66.6%) F:2 (33.3%)	0.616
Admission NIHSS	11 (4-22)	14 (4-20)	0.250
24th-hour NIHSS	7 (0-22)	17 (4-22)	**0.006**
Basilar artery involvement	1	6	**0.001**

*This patient was excluded from the cause of stroke-related death since the cause of death of one patient among the deceased patients was determined as ovarian cancer.

Lesion localization and etiology: Infarct regions were observed in the regions shown in Table 5 in relation to the affected vascular region (vertebral artery, proximal basilar artery, midbasilar, distal parts, PCA) in our patients presenting with acute posterior circulation stroke.

Table 5. Neuroanatomical distribution of lesion localization and applied treatments.

Lesion Localization	IVT N=11	MT N=8	IVT+MT N=3	Total N=22
Brainstem	7 (31.8%)	5 (22.7%)	2 (9%)	14 (63.6%)
Cerebellum	1 (4.5%)	4 (18.1%)	1 (4.5%)	6 (27.2%)
Occipital	4 (18.1%)	1 (4.5%)	0	5 (22.7%)
Thalamus	0	3 (13.6%)	1 (4.5%)	4 (18.1%)

One of 22 patients had a suspected dissection history and cardioembolism in 2 patients, atherosclerosis in 19 patients, and arterial to arterial embolism were considered in etiology.

Subgroup analysis of patients with basilar artery occlusion/stenosis: Especially the deceased patients were found to be associated with basilar artery thrombosis and subgroup analysis of patients with this artery involvement was performed and the data obtained are presented in Table 6.

Two patients with basilar thrombus had thrombus in the distal parts of the left vertebral artery and one in the distal parts of the right vertebral artery. In 2 of these 3 patients, a stent procedure was applied to the right vertebral artery V4 segment of one patient and to the top of the basilar artery localization of the other patient to prevent re-occlusion. Acetylsalicylic acid 1x100 mg was given in addition to clopidogrel 300 mg loading dose since these patients had not received IV thrombolytic treatment before. 9 were male patients among 11 patients, and comorbid diseases and their comorbidities were found to be higher. Among the 22 patients, 2 patients who presented with wake-up stroke were also included in this group. Admission NIHSS scores were high and mRS was 6 (deaths) in 6 patients. 5 patients were admitted in a state of coma. 2 patients received IVT, 6 patients received MT, 3 patients received IVT+MT treatments (Figure).

Intracranial bleeding complication: No intracranial bleeding complications were observed in our patients.

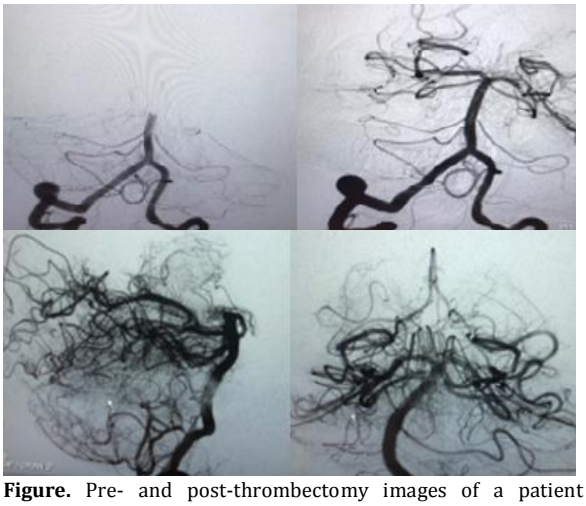

Figure. Pre- and post-thrombectomy images of a patient applying with basilar artery thrombosis.

DISCUSSION AND CONCLUSION

Posterior circulation ischemia is defined as a clinical picture resulting from embolic occlusion, in situ thrombosis, or stenosis of the posterior circulation arteries. Because the posterior circulation is rich in collateral, a difference between clinical manifestations is frequent. The most common symptoms can be listed as dizziness, unilateral weakness, dysarthria, ataxic gait, headache, nausea, vomiting, and nystagmus (9). Patients may be presented with low Glasgow Coma Scale (GCS), dysarthria, pupil abnormalities, cranial nerve disorders, or focal weakness.

In our study, it was found to be 9% among all our acute strokes, which is below 15-20% reported in the literature since patients with acute posterior circulation stroke who underwent IVT and/or MT were included in the study. However, GCS, where the lesions are completely settled with posterior circulation stroke and therefore the necessary interventions cannot be performed, is low and patients who had to refer to emergency ICU were excluded from the study, so the rate was thought to be lower than the literature in our study. Of the 22 patients, 6 (27%) died and these patients were found to be patients with high NIHSS, advanced age, and basilar artery involvement. Statistical significance was only associated with patients with basilar artery thrombosis and high 24th-hour NIHSS due to the small number of patients. 50% (11/22) of the patients at the time of discharge and 41% (9/22) of the patients at 3 months were mRS ≤2, and functional outcome was found to be good in these patients. It was seen that there were prolongations with the pandemic when the symptom-to-door, neurological evaluation-to-needle, and neurological evaluation-to-puncture times of the patients were examined. Patients apply to the hospital with the fear of being infected and experience anxiety and this leads to a delay in symptom-to-door times. Problems such as the simultaneous evaluation of COVID-19 patients with a certain intensity in the emergency department, sending these patients to thorax CT, and sometimes giving priority to those with respiratory distress caused prolongations in the duration of stroke patients' visit to imaging. Neurological evaluation was also reflected in the prolongation of CT time and subsequent prolongations in IVT and MT times even though

there are separate tomography units organized for COVID-19 patients and non-COVID-19 patients in our hospital. Especially the fact that patients over 65 years of age have restrictions on their physical activities due to curfew, that patients have problems in obtaining the medications they regularly use, and coming to the hospital for routine controls also reveal that they have difficulties in the control of risk factors. The problems related to the management of stroke patients were tried to be taken under control after the adaptation to the pandemic process and the necessary arrangements within our hospital. A study including a comparison of the above-mentioned periods before and during the COVID-19 period will be presented in a separate article.

Vertigo, nausea, vomiting, paresis, ataxia, gaze paresis, and coma were observed in our patients presenting with PCS.

It is stated in the literature that prodromal symptoms such as vertigo or headache may be observed in some of the patients with PCS 2-3 weeks before. 19% of patients had prodromal transient ischemic attacks and 19% had minor strokes in the BASICS study. Patients with atherosclerosis and proximal BA affect often have pre-warning symptoms and the clinic is more progressive while the clinic starts more acutely in patients with stroke on the basis of embolism and more distal BAOs according to this study (10). The most important symptom of basilar artery occlusion is a regression in consciousness. This is due to ischemia caused by obstruction of the reticular activating system entering the irrigation region of the basilar artery, especially the distal or middle part of the basilar artery. Top of the basilar artery syndrome is a catastrophic picture in BAOs and it is a picture that often develops due to embolic occlusion of the distal basilar artery, where visual, oculomotor results are in the foreground without significant motor results, sleep tendency and live hallucinations can be accompanied by additional clinical results such as hemianopia and cortical blindness may be seen if temporo-occipital involvement is added (1).

One of 22 patients had a suspected dissection history and cardioembolism in 2 patients, atherosclerosis in 19 patients, and arterial to arterial embolism were considered in etiology. However, the advanced examination could not be performed in all of them in this process due to the fact that the prognosis of the patients resulted in death or they were referred to external ICU as mentioned before.

Embolism is mentioned the most frequently in posterior circulation strokes in etiology in the literature. Studies using imaging in the diagnosis of basilar arterial occlusion have shown that while the cause was atherosclerosis in 26-36% of patients, the underlying cause was identified as embolism in 30-35% of patients. Among the remaining causes, VA dissections accounted for 6-8% and the underlying cause could not be detected in 22-35% of the patients. It is more common for the thrombus to extend to BA on the ground of embolism or VA dissection especially in young patients (10). Another cause in etiology is vertebrobasilar artery dolichoectasia.

27% of patients' prognosis resulted in death in our current study. Statistical significance could not be obtained in these patients because the male gender was more dominant and the number of patients was low even though their age was older. However, the prognosis of cases with high NIHSS and basilar artery involvement was found to be poor ($p<0.05$).

It is stated in the literature that male gender, advanced age, smoking, hypertension, and history of MI are risk factors for this group (11). NIHSS value may not be as helpful as anterior circulation strokes in patients with acute posterior circulation stroke because this group has ataxia or cranial nerve involvement without significant motor deficits. The 3-month clinical outcome may not be as expected even though they have a low NIHSS value (12). The PC-ASPECT score can be used to predict the outcome. Poor prognostic factors have been reported as the presence of basilar artery distal embolic stroke that does not allow time for collateral development, low GCS, tetraplegia, and pupil abnormality at the time of admission (13).

Early recanalization in PCS is essential to ensure good clinical outcomes and low mortality. An increase in the number of surviving patients was observed after the emergence of antithrombotic therapy and non-invasive imaging methods (1,14).

Good prognostic factors in the treatment response of the patients are young age, low NIHSS value, acute onset, minor stroke, mild-moderate deficit, early start of treatment, short occlusion length, small thrombus volume, distal location of the clot, good collaterals in angiography.

No intracranial bleeding complications were

observed in any of the treatments administered to our patients. The symptomatic intracranial bleeding rate was 0-6.9% in patients with posterior circulation ischemia who underwent IVT, and the rate of obtaining mRS 0-1 after the procedure was 38-49% (15). Similarly, the rate of intracranial bleeding after IVT was found to be lower in posterior circulation strokes in a study comparing IVT between anterior and posterior circulation strokes (16). Intracranial bleeding rates after IVT, perfect recovery (mRS 0-1), and functional independence rates were significantly higher in posterior circulation strokes in another study (17).

Mortality rates do not differ in anterior and posterior circulation strokes. This rate is 9-19% for the posterior circulation (15). The mortality rate was 27% in our present study.

It has been shown that the use of bridge therapy with modern thrombectomy devices and IVT/IAT significantly increases good clinical outcomes and decreases mortality (3,18,19). It was reported in a study investigating MT method in patients with acute basilar and posterior cerebral artery (PCA) occlusion that the recanalization rate of patients with BAOs without PCA occlusion was higher, recanalization was achieved and the functional outcome of patients with the posterior communicating artery (Pcom) was better (20) and similarly, there are studies pointing out the importance of the presence of Pcom and reporting that recanalization rates would be higher in the presence of Pcom (21,22).

It was reported in a study comparing MT in posterior and anterior circulation strokes that there were similar recanalization rates, symptomatic bleeding complications were observed less, and long-term functional outcome and mortality rates were similar even though the time between symptom onset and intervention was longer (23).

Recanalization in PCS is only part of the treatment and additional medical conditions that may develop in patients from the early period should be carefully monitored. Oral intake and aspiration risks of the patients should be evaluated and if necessary, nasogastric feeding should be ensured. It is important to prevent re-occlusion as well as the success of recanalization. Brainstem compression should be carefully monitored in patients with large cerebellar infarction, and patients should be referred to ventriculostomy or decompressive surgery without delay if necessary (1).

Studies show that PCS is a disease with a low survival rate and a high risk of addiction only when treated with conservative methods and/or IVT/IAT. Mechanical thrombectomy has entered into clinical use as a promising method in this regard and has reduced the mortality rate in this group of patients. Our knowledge of MT's place in the treatment of PCS will gradually increase with new studies in this field. Carlton et al. (24) compiled 25 articles including patients undergoing endovascular mechanical thrombectomy in acute posterior circulation occlusions in the review published in the 2021 World Neurosurgery January issue and they found that the mean age of these patients was 63 years; admission NIHSS was 19, the patients with mRS:0-2 at the 3rd month were 39% (16-79%), and the mortality rate was 30% (8-64%). This review included studies conducted after 2015, especially after the use of modern thrombectomy tools. Similarly, the mean age of our MT patients (+/-IVT) was 65 years and those with mRS:0-2 at 3 months were 18% in our study involving a limited number of patients. The mortality rate is 55%. The ranges are quite wide in the 3rd month mRS:0-2 and mortality rates in the aforementioned review. Our data seem to be compatible with the literature in this context.

In addition, the E-nabız system was used to access the follow-up data of the patients in our study. It is an easy and practical method in terms of reaching the status of death and other medical conditions of patients during follow-ups, and it is valuable to note the clinical course of patients on the computer environment in terms of patient follow-up and ease of accessing patient data in research.

Limitations of our study: This constitutes the limitation of our study since only the group receiving treatment was discussed in this study and no comparison was made with the group requiring conservative treatment. Our study, which includes the treated and non-treated groups, is under planning and will constitute the second part of our data. In addition, our study includes both retrospective and prospective data and the number of samples is limited. There is a delay in door-to-CT and door-to-treatment initiation times when patients apply to the emergency department. It is planned in this respect to take the necessary measures for a better

organization. In addition; the TICI scale, stent retriever, or direct aspiration in the procedure, how many bypasses were performed, and the duration of the procedure were not included in terms of recanalization of the vessel after MT. These data will be presented again in a separate article.

The rate of ischemic stroke-related death was 27% (6/22) among our patients. Examinations of one patient also found the cause of death to be metastatic ovarian cancer and this patient was excluded from the mortality rate.

Eight patients (29.6%) died in a study by Francalanza et al. (2019) involving 27 patients presenting with acute BAOs (25).

This rate decreased to 41% (9/22) in the 90-day period while the group with mRS:0-2 at discharge was 50% (11/22) in our patients. This is an indication that death may occur during follow-ups in posterior circulation strokes as stated in the literature.

Poor prognostic factors include advanced age, high NIHSS, low GCS, basilar artery occlusion, and especially the presence of brainstem infarcts.

Early intervention in posterior circulation strokes (especially thrombectomy performed within the first 8 hours), presence of collateral circulation, low NIHSS at admission, and young age prognosis are factors that positively affect the prognosis, as a result. Basilar artery occlusion and 24th-hour NIHSS were found to be poor prognostic factors in our study. More cheerful results are obtained in posterior circulation strokes today compared to the rates in the past.

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Table 6. Subgroup analysis of patients with basilar artery thrombosis among acute posterior circulation strokes.

Patient	Age	Gender	Comorbidity condition	Symptom-to-door time	Door-to-CT time	Neurology physician-to-needle time	Neurology physician-to-puncture time	Lesion localization	Application NIHSS	24th-hour NIHSS	Discharge NIHSS	Follow-up NIHSS	Treatment type	mRS (discharge)	mRS (1-3 months)	Basilar Artery Condition
1	29	M	Smoking	82	20	100	120	Paramedian pons Cerebellar vermis	4	9	6	6	IVT+MT	4	2	Basilar distal
3	46	M	Smoking, HL	120	11		115	Cerebellum, thalamus	22	3	1	1	MT	0	0	Basilar distal
5	52	M	DM, HT, SVO history	332	39		10	Cerebellum, medulla, thalamus	20	20	20	Death	MT	5	6	Basilar proc.
6	55	M	HT, DM, SVO history, bypass	122	22		40	Cerebellum, occipital	11	22	Death	Death	MT	5	6	Basilar 1/3 distal
7	56	M	-	68	24	70		pons	16	1	1	1	IVT	1	0	Midbasilar
12	70	M	HT, DM, CVH, HL	Wake-up	14		60	Thalamus, mesencephalon, cerebellum	20	21	Death	Death	MT	5	6	Basilar apex
13	71	M	HT, AF, SVO history	48	20	115		Cerebellum, pons, occipital	20	20	13	13	IVT	5	3	Midbasilar
14	72	F	HT, DM, HL	17	19	138	360	Thalamus	5	4	4	Death	IVT+MT	2	6	Basilar 1/3 distal
17	76	M	HT, HL	112	33		95	Pons, cerebellum	9	6	6	6	MT	3	2	Midbasilar
19	82	F	HT, CVD	Wake-up	22		85	Mesencephalon	20	22	Death	Death	MT	5	6	Basilar apex
21	84	M	HT, DM, AF, CVH	63	34		102	Mesencephalon	13	22	Death	Death	IVT+MT	6	6	Basilar apex

IVT: Intravenous thrombolysis; MT: mechanical thrombectomy, HT: hypertension; DM: diabetes mellitus; HL: hyperlipidemia; AF: atrial fibrillation; CVD: cardiovascular disease Wake up: Wake-up stroke; NIHSS: National Institutes of Health Stroke Scale; mRS: Modified Rankin; MT: mechanical thrombectomy,

Ethics

Ethics Committee Approval: The study was approved by Marmara University Medical Faculty Clinical Research Ethics Committee (Issue: 09.2019.432, Date: 05.04.2019).

Informed Consent: The authors declared that informed consent was signed by the patients.

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