

Comparison of Mechanical Thrombectomy Outcomes Before and During COVID-19 Pandemic

COVID-19 Pandemi Öncesi ve Sırasında Mekanik Trombektomi Sonuçlarının Karşılaştırılması

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Cite as: Çapar AE, Sercan Bitrak G, Baş DF, Sarıoğlu O, Arslan KE, Atasoy G, Köse Ş, Şener U, Belet Ü. Comparison of Mechanical Thrombectomy Outcomes Before and During COVID-19 Pandemic. Anatol J Gen Med Res. 2024;34(2):148-52

Abstract

Objective: To evaluate the reflection of the pandemic on the management of acute stroke mechanical thrombectomy (MT).

Methods: We retrospectively evaluated 100 acute ischemic stroke patients between March 1, 2019-February 29, 2020, and between March 1, 2020-March 1, 2021, who underwent (MT) at our institute. Patients were divided into two groups as those who underwent thrombectomy before the Coronavirus disease-2019 (COVID-19) pandemic (group 1) and those who underwent thrombectomy during the period of COVID-19 pandemic (group 2). All the diagnosis of stroke patients was confirmed by magnetic resonance imaging and computed tomography. Demographics, clinical and laboratory data were recorded. The SPSS version 26.0 was used for statistical analysis.

Results: A total of 100 patients, 50 before and 50 after the pandemic, were included in the study. No statistically significant difference was observed between the groups in terms of demographic data and risk factors. The time from symptom onset to groin puncture was significantly longer during the pandemic period than before ($p=0.001$). No significant difference was observed in the time from groin puncture to recanalization ($p=0.251$), recanalization rates ($p=0.806$) and the number of passes ($p=0.889$). There was no difference between the pre-pandemic and post-pandemic groups in terms of the frequency of intracranial hemorrhage ($p=0.501$), complication ($p=0.153$) and decompression ($p=0.538$) after thrombectomy. The modified Rankin scores scores at 3 months were similar ($p=0.316$).

Conclusion: As a result, the time from symptom to procedure is prolonged in acute ischemic stroke patients who underwent MT in our center during the pandemic period. In the respect of procedural findings and outcomes of thrombectomy before and during pandemic, there had been no significant change at our center.

Keywords: Mechanical thrombectomy, acute stroke, COVID-19



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Received/Geliş tarihi: 11.05.2023
Accepted/Kabul tarihi: 14.08.2023



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Öz

Amaç: Pandeminin akut inmede mekanik trombektomi (MT) yönetimi üzerindeki yansımaları değerlendirmektir.

Yöntem: Kliniğimizde MT uygulanan 100 akut iskemik inme hastası retrospektif olarak değerlendirildi. Hastalar, Koronavirüs hastalığı-2019 (COVID-19) pandemisinden önce trombektomi geçirenler (grup 1, 1 Mart 2019-29 Şubat 2020) ve COVID-19 pandemi döneminde trombektomi geçirenler (grup 2, 1 Mart 2020-1 Mart 2021) olmak üzere iki gruba ayrıldı. İnme tanıları manyetik rezonans görüntüleme ve bilgisayarlı tomografi ile doğrulandı. Demografik, klinik ve laboratuvar verileri kaydedildi. İstatistiksel analiz için SPSS sürüm 26,0 kullanıldı.

Bulgular: Çalışmaya her biri 50 hastadan oluşan toplam 100 hasta dahil edildi. Demografik veriler ve risk faktörleri açısından gruplar arasında istatistiksel olarak anlamlı bir fark gözlenmedi. Ancak, semptom başlangıcından kasık ponksiyonuna kadar geçen süre pandemi döneminde önemli ölçüde daha uzundu ($p=0,001$). Kasık ponksiyonundan yeniden kan akışının sağlanmasına kadar geçen süre ($p=0,251$), yeniden kan akışının sağlanma oranları ($p=0,806$) ve geçiş sayıları ($p=0,889$) açısından anlamlı bir fark gözlenmedi. Ek olarak, pandemi öncesi ve sonrası gruplar arasında intrakraniyal kanama sıklığı ($p=0,501$), komplikasyonlar ($p=0,153$) ve trombektomi sonrası dekompresyon ($p=0,538$) açısından fark yoktu. Üç ay sonraki modifiye Rankin skorları da iki grup arasında benzerdi ($p=0,316$).

Sonuç: Pandemi döneminde MT uygulanan akut iskemik inme hastalarında semptom başlangıcından işlemin gerçekleştirilmesine kadar geçen süre uzamıştır. Ancak, merkezimizde pandemi öncesi ve sonrası trombektomi prosedürel bulguları ve sonuçları açısından önemli bir değişiklik olmamıştır.

Anahtar Kelimeler: Mekanik trombektomi, akut inme, COVID-19

Introduction

The Coronavirus disease-2019 (COVID-19) pandemic has created a public health crisis worldwide. One of the significant complications of COVID-19 is acute ischemic stroke⁽¹⁾. As previously mentioned in numerous publications, COVID-19 induces a prothrombotic state with high levels of factor 8, fibrinogen, and D-dimer, leading to occlusive and embolic pathologies⁽²⁾. This proclivity to clotting intensifies the embolic process, resulting in stroke. It is believed to have led to a higher incidence of acute ischemic stroke. A study conducted with 214 patients in Wuhan reported the incidence of stroke as 2.34%⁽³⁾, whereas another study from New York reported it as 0.9%⁽⁴⁾.

Our aim in this study was to investigate the effect of hospital and transport measures implemented during the pandemic on the process in the stroke center, regardless of the COVID-19 status of the stroke patients. We evaluated the impact of the pandemic on the management of acute stroke mechanical thrombectomy (MT) at our center. We compared the outcomes and MT data of acute stroke patients who underwent MT before the COVID-19 pandemic and after its onset.

Materials and Methods

We retrospectively evaluated 100 acute ischemic stroke patients from March 1, 2019, to February 29, 2020, and from March 1, 2020, to March 1, 2021, who underwent MT at our institute. Patients were divided into two groups: Those who underwent thrombectomy before the COVID-19 pandemic (group 1) and those who underwent thrombectomy during

the COVID-19 pandemic (group 2). The stroke diagnosis for all patients was confirmed by magnetic resonance imaging and computed tomography. Demographic, clinical, and laboratory data were recorded. Age, gender, preexisting vascular risk factors, laboratory values, anticoagulant and antiplatelet premedications, National Institutes of Health Stroke Scale score upon admission and at discharge, ASPECT score, occluded vessel location, use of preprocedural lytic medication, modified Rankin scores (mRS), procedure times (onset to groin puncture, door to needle, groin puncture to recanalization), device pass counts until successful recanalization or last angiogram if recanalization failed, thrombolysis in cerebral infarction (TICI) scales, early neurological improvements, post-procedure hemorrhage, decompression surgery, type of anesthesia during the procedure, and periprocedural complications were analyzed between the groups. The TOAST classification was used to determine stroke etiology.

Local ethics committee approval was obtained from the University of Health Sciences Turkey, İzmir Tepecik Education and Research Hospital Ethical Committee in compliance with the Declaration of Helsinki Ethical Standards for this retrospective single-center study (approval no: 2020 8-9, 08.07.2020).

Statistical Analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 26.0 (SPSS Inc., Chicago, IL, USA). Continuous data were expressed as means \pm standard deviation and categorical variables as percentages. The distribution of variables was assessed by

the Kolmogorov-Smirnov test. Patients were divided into two groups: Pandemi and non-pandemic. Chi-square test or Fisher's Exact test was used for categorical variables. Mann-Whitney U test or independent t-test was performed to compare continuous variables.

Results

Demographics and Clinical Characteristics

A total of 100 patients, 50 before and 50 during the pandemic, were included in the study. No statistically significant difference was observed between the groups regarding demographic data and risk factors. Gender ($p=0.216$), diabetes mellitus ($p=0.534$), hypertension ($p=0.687$), and atrial fibrillation ($p=0.517$) showed no significant differences. In terms of the TOAST classification, the groups were similarly distributed ($p=0.259$). The frequency of antiplatelet use was nearly the same ($p=0.488$), but anticoagulant use was higher in the pre-pandemic group ($p=0.046$). Demographic and preprocedural clinical statistics details are shown in Table 1.

The time from symptom onset to groin puncture was significantly longer during the pandemic than before ($p=0.001$). No significant differences were observed in the time from groin puncture to recanalization ($p=0.251$), recanalization rates (TICI 2b-3) ($p=0.806$), number of passes ($p=0.889$), or general anesthesia rates ($p=0.656$). Frequencies of intracranial hemorrhage ($p=0.501$), complications

($p=0.153$), and decompression ($p=0.538$) post-thrombectomy did not differ between the pre-pandemic and post-pandemic groups. The 24-h NIHSS scores ($p=0.173$) and the mRS scores at 3 months were also comparable ($p=0.316$). Procedural and postprocedural statistics are presented in Table 2.

Discussion

The impacts of COVID-19 on the early and late outcomes of ischemic stroke patients undergoing thrombectomy need clarification⁽⁵⁾. The demographic data and TOAST classification of our patients remained consistent during the pandemic. Our sample size is relatively small, limiting definitive conclusions about the relationships among the pandemic, risk factors, and etiological causes of ischemic stroke. In addition, the inclusion of only MT patients in the study limits our understanding of these relationships. Although the frequency of AF and etiological causes remained unchanged, there was a reduced frequency of anticoagulant use during the pandemic. This suggests that the pandemic might have affected drug use or hindered the diagnosis of other indications. Larger and more comprehensive stroke studies can shed more light on this.

We found that the time from symptom onset to groin puncture was significantly longer during the pandemic. This delay could be attributed to patients avoiding hospitals for fear of COVID-19 transmission and potential in-hospital delays due to heightened COVID-19 precautions. Our study only

Table 1. Demographic and preprocedural clinical statistics

	Before pandemic	During pandemic	p-value
Age (mean)	61.62	63.06	0.375
Gender	28	34	0.216
DM	17 (34%)	20 (40%)	0.534
HT	27 (54%)	29 (58%)	0.687
AF	17 (34%)	14 (28%)	0.517
TOAST classification			
LAA	28 (54%)	28 (54%)	0.259
Cardioembolic	19 (38%)	18 (36%)	
Other	3 (6%)	1 (2%)	
Cryptogenic	0	3 (6%)	
Initial NIHSS score	16.2	15.4	0.777
Initial ASPECT skor	9	9	0.732
iv-tPA medication	11 (22%)	18 (36%)	0.123
Anticoagulant medication	38 (76%)	12 (24%)	0.046
Antiagregan medication	20 (40%)	22 (44%)	0.488

DM: Diabetes mellitus, HT: Hypertension, AF: Atrial fibrillation, NIHSS: National Institutes of Health Stroke Scale

Table 2. Procedural and postprocedural statistics

	Before pandemic (n=50)	During pandemic (n=50)	p-value
Onset to groin puncture time (mean min.)	171.50	240.46	0.001*
Groin to recanalisation time (mean min.)	60.23	58.27	0.251
Number of passes	2	1.84	0.889
Recanalisation (TICI 2b-3) (n)	39 (78%)	40 (80%)	0.806
General anesthesia (n)	13 (26%)	15 (30%)	0.656
Complication (n)	0	2 (4%)	0.153
24. hour NIHSS score	12.6	9.82	0.173
Intracranial hemorrhage (n)			
Hi-1	1 (2%)	2 (4%)	0.501
Hi-2	5 (10%)	7 (14%)	
PH-1	3 (6%)	6 (12%)	
PH-2	10 (20%)	5 (10%)	
Decompression surgery (n)	7 (14%)	5 (10%)	0.538
3. month mRS 0-2 (n)	21 (42%)	26 (54%)	0.316
NIHSS: National Institutes of Health Stroke Scale, mRS: Modified Rankin scores, TICI: Thrombolysis in cerebral infarction			

captured the time from symptom onset to groin puncture. Future studies should delve deeper, measuring times both pre-hospital and in-hospital, to better understand these delays.

Our study's procedural durations remained consistent between the groups. Potential reasons might include the consistency of interventional physicians performing the procedures across both periods and the fact that COVID-19 precautions were implemented before groin puncture, negating any additional delays. The fact that the number of passes and recanalization rates remained unchanged suggests that thrombus structures may have remained consistent, although larger histopathological studies are needed to confirm this.

Study Limitations

There are inherent limitations to our study, including its retrospective nature and the need for emergency indications for stroke treatment. Additionally, because of the pandemic's impact on emergency room admissions, our sample size is limited. Despite these limitations, our research aligns with similar studies on the subject. Comparable results were found in a study by Kurnianto et al.⁽⁶⁾, and Kerleroux et al.⁽⁷⁾ observed a 21% decrease in MT procedures and an increase in imaging and groin access times during the pandemic.

Zureigat et al.⁽⁸⁾ reported that COVID-19 adversely impacted clinical outcomes in stroke patients.

In our study, clinical outcomes remained consistent during the pandemic. The delay in symptom onset to the procedure did not significantly impact outcomes, but this may be attributed to the small sample size. Further studies with larger populations are required to validate these findings.

Conclusion

The time from symptom onset to the procedure was longer for acute ischemic stroke patients who underwent MT at our center during the pandemic. However, procedural findings and outcomes remained consistent both before and during the pandemic at our center.

Ethics

Ethics Committee Approval: Local ethics committee approval was obtained from the University of Health Sciences Turkey, İzmir Tepecik Education and Research Hospital Ethical Committee in compliance with the Declaration of Helsinki Ethical Standards for this retrospective single-center study (approval no: 2020 8-9, 08.07.2020).

Informed Consent: Retrospective study.

Authorship Contributions

Surgical and Medical Practices: A.E.Ç., D.F.B., O.S., Ü.B., Concept: D.F.B., U.Ş., Ü.B., Design: A.E.Ç., D.F.B., Ü.B., Data Collection or Processing: G.S.B., K.E.A., G.A., Analysis or Interpretation: O.S., Literature Search: A.E.Ç., G.S.B., G.A., Ş.K., U.Ş., Writing: A.E.Ç., G.S.B.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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