

# Mechanical thrombectomy in acute ischemic stroke: Experiences of the Upper-Silesian Medical Center in Katowice based on the treatment of the first 500 patients

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## INTRODUCTION

Cardiovascular diseases constitute a significant clinical and economic problem. Stroke is also one of the most important causes of disability in Europe [1].

Subsequent randomized clinical trials (MR CLEAN [2], ESCAPE [3], REVASCAT [4]) confirmed the validity of mechanical thrombectomy (MT) for the acute phase of ischemic stroke therapy.

A pilot program for the treatment of ischemic strokes by MT based on a centralized system is being carried out in the Silesian Province. Patients are referred to the central treatment center after preliminary diagnosis in regional centers for targeted therapy. In order to provide medical services round the clock, various groups of specialists were on duty: interventional cardiologists (ICs), vascular surgeons, interventional radiologists, and other specialists (OSs).

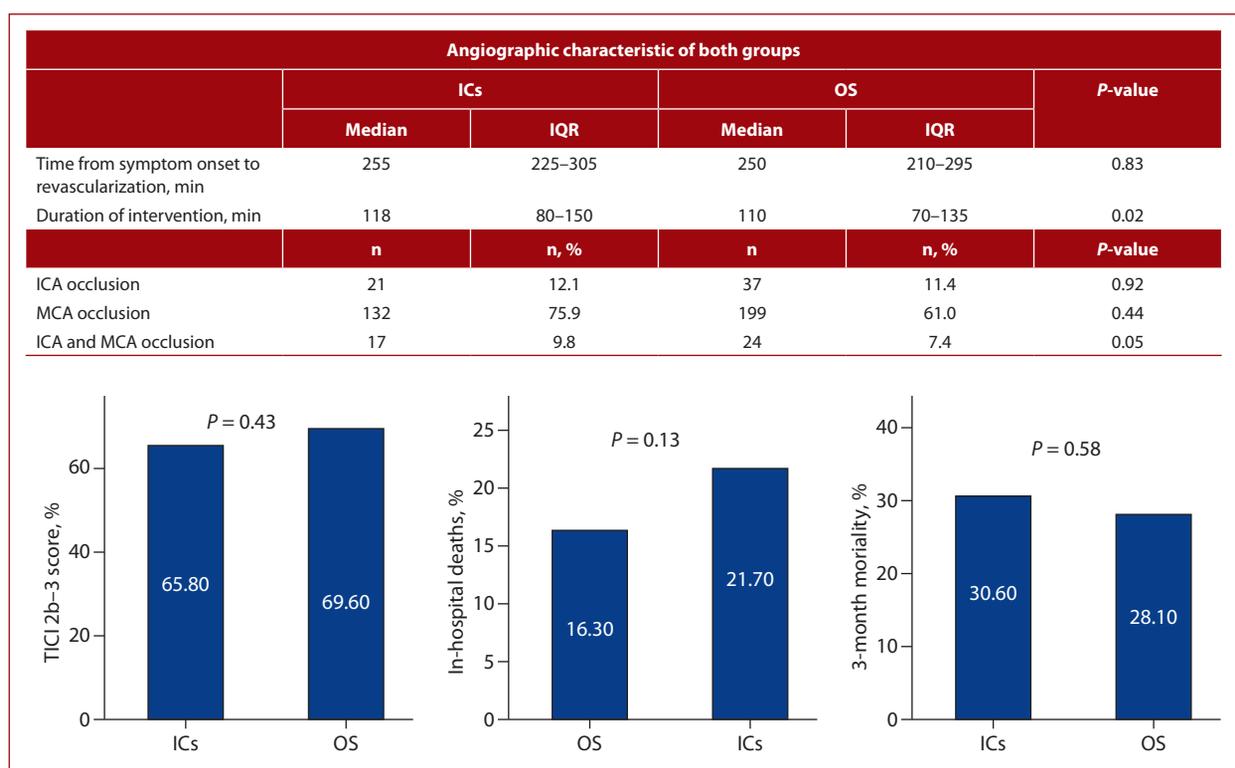
This study aimed to compare clinical outcomes for acute stroke patients treated by ICs or treated by OSs. MT was used as the treatment method. In order to perform the MT procedure, the available infrastructure of the invasive cardiology department (CathLab) was used.

## METHODS

We present a single-center prospective study. We included 500 ischemic stroke patients (mean [standard deviation, SD]) aged 67 (9) years (52% women) with confirmed large

vessel occlusion (LVO). The first patient was included in the study in November 2018 and the last one in June 2021. The patients were enrolled consecutively. The procedures were performed by ICs (n = 174) and by OSs (n = 326). The study was conducted over two years. The study was based on a protocol approved by the Bioethical Committee of the Medical University of Silesia. Based on information from the central system, patients were referred from 20 regional neurological departments for further investigation and treatment. After initial verification and confirmation of the ischemic stroke in an imaging examination in a regional hospital, patients were transferred to the central hospital. The final decision and qualification of the patient for treatment was made by a neurologist at the central hospital. The maximum time from the onset of symptoms to starting treatment could not exceed 6 hours. The detailed exclusion criteria, periprocedural pharmacological therapy, and technical aspects of the procedure are described in detail in another publication [5].

Catheter thrombectomy was performed according to the weekly schedule of 3 vascular surgeons (covering 3 days a week), 2 neuroradiologists (operating 2 days a week), and 2 ICs (2 days a week). The ICs training included: (1) participation in 150 procedures in the field of neuroradiology, including at least 50 performed independently (supplying cerebral vascular malformations, embolization of



**Figure 1.** Angiographic characteristics of both groups

Abbreviations: ICs, interventional cardiologists; ICA, internal carotid artery; IQR, interquartile range; MCA, middle cerebral artery; OS, other specialists; TICl, Thrombolysis in Cerebral Infarction

aneurysms, angiomas, fistulas, placement of intracranial stents, thrombectomy) or performing 50 procedures in the field of endovascular treatment, including at least 5 performed independently in the presence of a proctor; (2) participation in the training course on intravascular treatment of ischemic cerebral strokes or a course at a foreign MT treatment center; (3) 3-month internship in a ward in a neurology department with a stroke unit to learn about the MT treatment procedures applicable in Poland.

Statistical analysis was performed with SPSS v25.0 software (IBM Corp, Armonk, NY, US). The original data were presented as median (interquartile range [IQR]), and quantitative variables were described as the mean and standard deviation (SD) (parameters with normal distribution). Throughout the analysis, Student's t-test was used for normal distribution, while the Mann-Whitney U test was used to compare continuous variables with abnormal distribution. The assumption of the normal distribution was tested using the Shapiro-Wilk test. Pearson's  $\chi^2$  test was used for the qualitative parameters. A *P*-value of less than 0.05 was considered statistically significant.

## RESULTS AND DISCUSSION

Five hundred patients were enrolled in the study. Patients were assigned into two groups: treated by ICs or treated by OSs, according to the randomization process described previously. The study groups did not differ statistically in basic characteristics (Supplementary materials, *Table S1*). The

procedure was performed on median 255 (IQR, 210–302) minutes after the onset of symptoms. In 13% (61 strokes), strokes affected the internal carotid artery basin. A TICl (Thrombolysis in Cerebral Infarction) score of 2b or 3 was considered to be an angiographic success. TICl 2b or 3 was obtained in 341 patients (68.2%). Clinical results were assessed using a modified Rankin scale (mRS). The median of the mRS score on discharge was 4 (IQR, 2–5). The thrombectomy procedure was performed in 174 patients (34.8%) by the ICs. There was no difference in the angiographic results (TICl 2b or 3 ICs vs. OS, 65.8% vs. 69.6%; *P* = 0.68) in procedures performed by ICs or OSs. In-hospital deaths have been reported in 21.7% in the IC group and 16.3% in the OS group (*P* = 0.13), 3-month mortality and the mRS score after 3 months were: 30.6% vs. 28.1% in the ICs group vs. the OS group (*P* = 0.58) and mRS median score 3 (IQR, 1–4) vs. median 3 (IQR, 1–4) in the IC group vs. the OS group (*P* = 0.1), respectively (Figure 1).

Widespread acceptance of the efficacy of MT in treating acute stroke occurred in 2015 with the publication of a series of clinical trials demonstrating the benefit of endovascular treatment methods. Currently, 17 centers conduct an MT program in Poland. MT to treat LVO causing a stroke is one of the most effective treatments in medicine, with a number needed to treat to improve clinical outcomes as low as 2.6 [6]. The effectiveness of the therapy largely depends on the time from the starting symptoms to the beginning of the therapy. This period is referred to as “door-

to-puncture" (DTP), i.e. time from arrival to hospital to groin access for MT. A centralized system allows to shorten the DTP time. Research confirms that referring patients from local centers to central ones, operating in the 24-hour on-call mode, does not worsen the long-term prognosis of patients [7].

Cardiologists have a long track record in cardiovascular interventional therapy. Functioning today CathLabs provide consistent and reliable management for the majority of patients. Experienced cardiologists achieve a similar percentage of satisfactory MT angiographic results (TICI 2b or 3) as vascular surgeons, interventional radiologists, or neurosurgeons [8]. However, despite successful attempts to use CathLab facilities in Poland and the experience of ICs in the treatment of ischemic stroke using MT, there are still few cardiac centers offering this method of treatment [9]. As noted by Grunwald et al. [10] in their editorial, not all neurologists agree that large medical centers with a neurosurgical and radiological background are the only proper way of reporting the MT program. The availability of such highly specialized centers is limited. It should be remembered that the clinical outcomes of MT treatment depend mainly on early reperfusion, and not on the type of the center that performs the procedure.

It should be noted that there are significant differences between coronary and cerebral vessels, such as the fragility of the cerebral circulation. Perhaps this is the reason why procedures performed by cardiologists took longer than those performed by other specialists. However, the short-term and long-term outcomes for patients after the MT procedure did not differ significantly depending on the operator's specialty. It is worth noting that ICs quickly mastered the treatment technique at a level comparable to that of OSs. In the first study published by our center, 55.7% of ICs obtained the TIMI 2b-3 value; in the current study, which was carried out on 500 patients, this percentage increased to 65.8% (ICs 65.8% vs. OS 69.6%;  $P = 0.43$ ) [8]. In our study and in the results of other centers, the treatment outcome depends mainly on the extent of the stroke, duration of symptoms, and comorbidities, and not on the operator's specialization [11].

Taking into account equally good results of the treatment of ischemic stroke by ICs using the MT method, wider involvement of ICs should be considered.

### Supplementary material

Supplementary material is available at [https://journals.viamedica.pl/kardiologia\\_polska](https://journals.viamedica.pl/kardiologia_polska).

### Article information

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