

Mechanical Thrombectomy for Acute Ischemic Stroke Secondary to Infective Endocarditis

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Intravenous thrombolysis is contraindicated in acute ischemic stroke secondary to infective endocarditis. We report our initial experience in 6 cases of proximal vessel occlusion treated with mechanical thrombectomy, which was safe (no bleeding) and effective (significant early neurological improvement) and might be useful in this clinical setting.

Keywords. infective endocarditis; acute ischemic stroke; cerebral embolism; mechanical thrombectomy; safety.

Approximately 30% of infective endocarditis (IE) cases present symptomatic neurological complications, most of which are central nervous system (CNS) embolic events, with the middle cerebral artery being the most frequently affected vessel. Intravenous thrombolysis has been associated with a high rate of hemorrhagic transformation [1] and is not recommended in embolic events caused by IE. Consequently, the prognosis following a neurological complication of IE remains poor, because effective and safe treatments are lacking [2]. Indeed, the prognosis of IE worsens significantly when a neurological complication occurs, compared to cases without these complications [3].

Mechanical thrombectomy (MT) is an endovascular technique used in the treatment of strokes with large-vessel occlusion and has much better results than medical therapy alone, when performed within the first hours of the ischemic event. The value of MT in stroke has been demonstrated in clinical trials [4–9], but its usefulness and safety in acute CNS embolism secondary to IE are unknown, because IE was an exclusion

criterion in 3 of these trials [6, 7, 9], and the others did not include any IE cases, despite not explicitly excluding them [4, 5, 8]. The objective of the article is to describe the clinical and neurological evolution of 6 consecutive cases of acute CNS embolism in the context of IE treated with MT in our institution.

METHODS

According to the modified Duke criteria, we identified patients with IE (definite or possible) undergoing MT who were recorded in the databases of acute revascularization therapy of ischemic stroke and IE of the Hospital Clínic, Barcelona, Spain, a tertiary referral center for both stroke and IE. MT was performed using devices and criteria similar to those used in the REVASCAT clinical trial [8], except that patients with posterior circulation strokes were also included. We graded the revascularization using the modified thrombolysis in cerebral infarction scale (scale of 0–3, with higher grades indicating increased reperfusion) and considered it successful when grade 2B or 3 was obtained at the end of the procedure. We measured the neurological course with the National Institutes of Health stroke scale (0–42, with higher values indicating more severe deficit), and we defined dramatic early recovery as a score of 0–2 on this scale or an improvement of ≥ 8 points at 24 hours. Finally, we measured functional outcome at 3 months with the modified Rankin scale, a graded interval scale (from 0 [no symptoms] to 6 [death]) for the assessment of neurological functional disability, and we defined a favorable outcome as a score of ≤ 2 .

RESULTS

Between January 2011 and June 2017, 1966 stroke codes were activated and 494 MT were performed in our institution. In 6 cases (1.20%), IE in left cavities (definite or possible) was identified as the cause of the stroke.

Descriptions of the 6 patients are provided in Table 1. Their median age was 75.5 years (interquartile range, 59–79 years), and 50% were men. In 4 of the 6, the diagnosis of IE preceded the stroke. Four cases were prosthetic and 2 were native valve IE. Four of the 6 patients had a dramatic early recovery after MT. Three patients died (modified Rankin scale score at 3 months, 6), all of nonneurological causes: the first patient experienced a cardiorespiratory arrest in the acute phase of the stroke and then multiple organ failure, the second died after palliative care owing to numerous comorbid conditions and with moderate neurological deficits, and the third recovered completely after MT but refused cardiac surgery and died during follow-up. None of the 6 patients presented any hemorrhagic transformation. In the 2 patients in whom molecular biology of the extracted thrombus was performed (patients 2 and 4),

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Table 1. Clinical and Radiological Characteristics of 6 Patients With Stroke and Infective Endocarditis Treated With Mechanical Thrombectomy

Patient	Year	Sex/Age, y	Antithrombotic Treatment	IE	IE Type	Microbiology	Stroke diagnosis	Baseline NIHSS Score	Occlusion Site	Time From Stroke to Groin Puncture, min	Device	mTICI Scale Score	24 h NIHSS	Intracranial Hemorrhage	mRS Score at 7 d/3 mo
1	2011	M/79	Acenocumarol and aspirin	Definite	Prosthetic (mechanical)	<i>Staphylococcus aureus</i>	After IE diagnosis	9	Tandem (carotid subocclusion plus M1)	175	Stent retriever (Solitaire) plus carotid stent	0	35	No	6/6 ^a
2	2012	F/69	Acenocumarol ^b and aspirin	Definite	Prosthetic (mechanical)	<i>Streptococcus oralis</i> ^c	After IE diagnosis	10	Basilar	255	Stent retriever (Trevo)	3	2	No	0/0
3	2012	F/56	Aspirin	Possible	Native	Negative culture	After IE diagnosis	19	M1	140	Stent retriever (Trevo)	3	2	No	0/0
4	2014	M/72	None	Possible	Native	<i>Streptococcus dysgalactiae</i> ^c	Before IE diagnosis	35	Basilar	190	Stent retriever (Trevo)	3	35	No	6/6 ^d
5	2017	F/79	Acenocumarol ^b	Definite	Prosthetic (biological)	Negative culture	After IE diagnosis	5	M1	100	Stent retriever (Trevo)	2B	2	No	2/2
6	2017	M/85	None	Definite	Prosthetic (biological)	<i>Staphylococcus epidermidis</i>	Before IE diagnosis	8	M1	158	Stent retriever (Trevo)	3	0	No	0/6 ^e

Abbreviations: F, female; IE, infective endocarditis; M, male; M1, first segment of the middle cerebral artery; mRS, modified Rankin scale; MT, mechanical thrombectomy; mTICI, thrombolysis in cerebral infarction; NIHSS, National Institutes of Health stroke scale.

^aCardiorespiratory arrest during MT and death 2 days after the stroke.

^bAcenocumarol was replaced by intravenous heparin at admission.

^cFindings of molecular biology of the extracted thrombus were also positive.

^dPalliative care only and death 3 days after the stroke.

^eRejection by the patient of additional cardiac surgery and death 6 weeks after stroke, due to cardiac arrest.

the microorganism was also identified. [Supplementary Table S1](#) compares the clinical characteristics and outcomes in our patients and in clinical trials of MT.

DISCUSSION

Up to 30% of IE cases present with clinically evident neurological complications, most of which are CNS embolic events [2]. The treatment of acute ischemic stroke is based on the timely recanalization of the occluded vessel. However, scarce evidence is available to show the benefit of revascularization in the context of IE. The rate of postthrombotic intracerebral hemorrhage was significantly higher in patients with than in those without IE (20% vs 6.5%; $P = .006$) [1]. Owing to this unacceptably high rate of complication, intravenous thrombolysis is not currently recommended in patients with IE [10]. Anticoagulation and antiplatelet therapy have little impact on the outcome of acute stroke, and both have also been associated with increased bleeding complications. As a consequence, there is a virtual absence of specific therapeutic options for acute ischemic stroke due to IE.

Previous reports on MT in IE have been limited to a few case series, the largest describing 3 cases, and overall they have suggested high recanalization rates and favorable outcomes [11, 12]. Our report on the 6 consecutive patients with stroke due to IE who underwent MT at our institution also suggests that the recanalization rates and neurological outcomes in these patients are similar to those described in the general population of patients with stroke due to large-vessel occlusion who are treated with MT. Overall, the outcome in our patients (dramatic early recovery in 67%) was comparable to that in the intervention arm of the MT clinical trials, as shown in [Supplementary Table S1](#). In terms of the procedure's safety, the absence of any hemorrhagic complication is reassuring, and the relatively high mortality rate may, in fact, be related to the inclusion of patients with basilar artery occlusion, to their cardiovascular comorbid conditions (as in patient 1), and to the generally bad prognosis of IE cases with neurological complications [3].

The occurrence of a neurological complication significantly increases the mortality rate in patients with IE [3]. Moreover, those who survive may have significant morbid effects. The prognosis is poor for patients with strokes caused by proximal vessel occlusion. In the pooled analysis of the 5 major trials to demonstrate the efficacy of MT, functional independence was achieved by only 46% of patients in the intervention and 26.5% in the control population. Several studies have even suggested that the outcomes of strokes related to IE are worse than those of strokes with other causes. The majority of our patients shows early neurological recovery, similarly to previously reported findings [11, 12], although the global mortality rate remains high. The short delay to groin puncture may explain the favorable neurological outcomes; groin puncture was performed within 4.5 hours throughout our case series.

Finally, the presence of a neurological complication also affects the indication and timing of cardiac surgery. The risk

of cardiac surgery must be weighed against the risk of embolic stroke. Given that embolic risk reduces significantly after 7–10 days of effective antimicrobial therapy [3], clinicians with the option of MT might decide to defer cardiac intervention if the only indication for surgery is the prophylaxis of an acute ischemic stroke. The need for multidisciplinary and multispecialty teams for IE has become evident in recent years, and a neurologist should probably be part of these dedicated teams.

In conclusion, although no evidence has emerged from the randomized trials demonstrating the efficacy of MT, our experience suggests that MT is indeed effective and safe in patients with a proximal vessel occlusion secondary to IE, particularly when they are treated early (within 4.5 hours). MT was not associated with hemorrhagic complications and none of the patients died due to neurological causes. Although it would be advisable to conduct more extensive studies, in the meantime, MT might still be considered as a treatment option for cerebral embolism with proximal occlusion due to IE. However, despite the rapid neurological recovery observed in our patients and in previous reports, the overall prognosis remains poor for patients with IE complicated by stroke.

MT will probably become increasingly available in coming years, and clinicians should be aware of this therapeutic option in patients with IE. Clinical trials on MT in the context of IE are unlikely, because the frequency of IE among the entire stroke population is relatively low. Nevertheless, evidence showing the value of MT in IE will probably still increase in the near future should more patients with IE benefit from MT.

Supplementary Data

Supplementary materials are available at *Clinical Infectious Diseases* online. Consisting of data provided by the authors to benefit the reader, the posted materials are not copyedited and are the sole responsibility of the authors, so questions or comments should be addressed to the corresponding author.

Notes

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