

Repeated mechanical thrombectomy in relapsing acute ischemic stroke with occlusion of large intracranial artery

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Background

Ischemic stroke caused by large vessel occlusion (LVO) is a devastating condition. Endovascular treatment (EVT) is effective and safe treatment and became a standard in care of these patients in defined time window.^[1] Almost 25% of patients with ischemic stroke suffer a recurrent stroke within 5 years.^[2] Risk of recurrence of stroke with LVO has not been defined yet, but the estimation is approximately 2%.^[3-5] Another issue is effectiveness and safety of repeated thrombectomy in real clinical practice. According to available literature, there are 3 papers with patient cohorts of 16, 15 and 7 patients and several case reports published.^[3-8] Average time window since index stroke was 18 days (1-915 days). Good recanalization (TICI 2b and 3) was achieved in 100% strokes. Cardioembolism was cause in 45% of patients, rare causes in 21%, extracranial atherosclerosis in 2 and intracranial in 1 patient, 26% of strokes were cryptogenic.^[3-5] After 3 months, 50% of patients had good clinical outcome (mRs 0-2), mortality was 30%. One patient died due to haemorrhagic complication of EVT.^[3-5]

Results

In our cerebrovascular centre we had treated 547 patient since 1st May 2013 until 1st March 2019. (Figure 1)

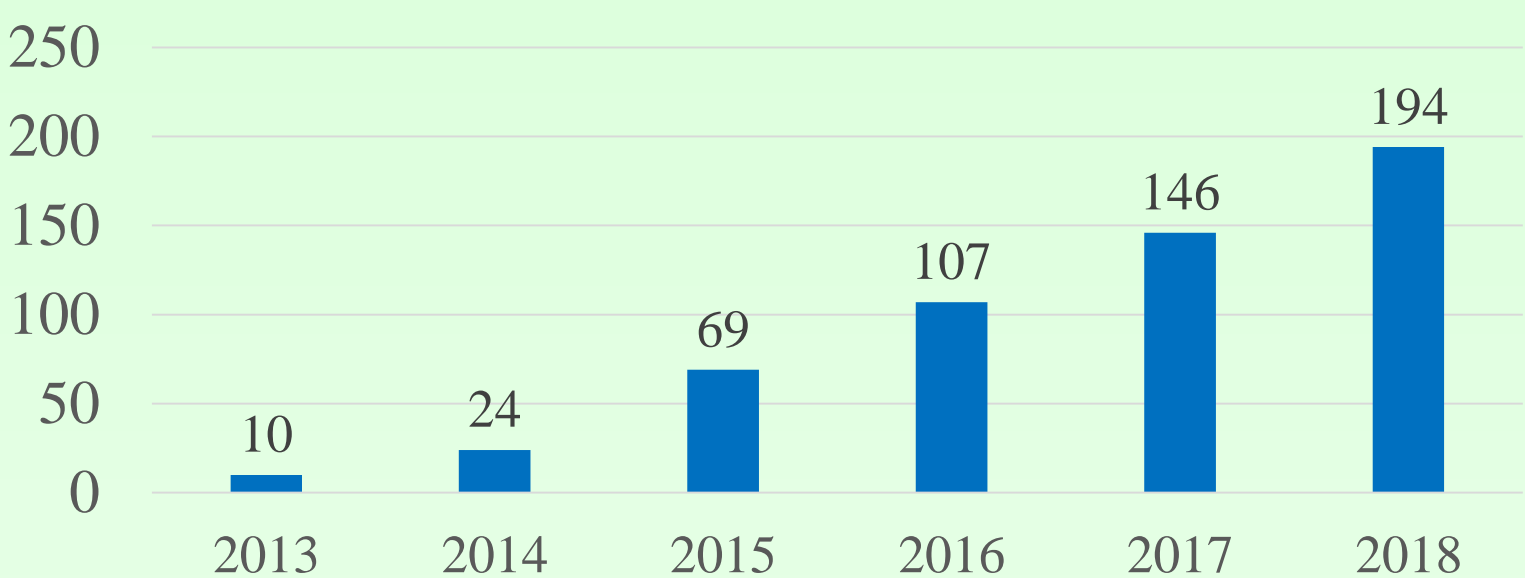


Figure 1. Increasing number of thrombectomies per year in cerebrovascular centre Faculty Hospital Trnava, Slovakia

Between 1st October 2013 and 1st January 2019 there were 368 ischemic strokes with large vessel occlusion (LVO) treated with EVT in our cerebrovascular centre. 9 out of these were treated repetitively (2.44%). Mean time interval between index and second stroke was 2 days (1 hour to 6 days).

Brief baseline characteristics are summarized in Table 1. 5 out of 9 CT scans before second EVT revealed acute ischemic lesion, in 2 cases was dense artery sign present.

	All strokes	Recurrent strokes
n	368	9
females	158 /42,9%/	5 /55.6%
age	68 /22-88/	65 /52-76/
NIHSS	16 /3-36/	19 /5-34/

Table 1. Baseline characteristics

Second stroke was caused by LVO in the anterior circulation in two thirds of cases. In 4 patients was LVO reoccluded in the same segment. (Figure 2)

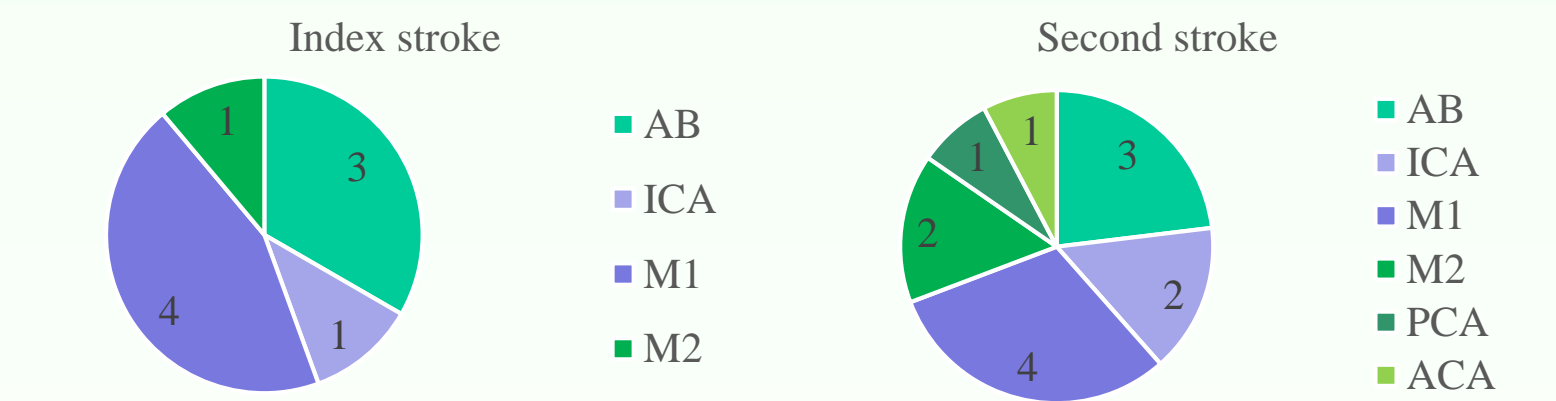


Figure 2. Comparison of the vessels occluded in case of first and second CTAG

Average time intervals to examination or treatment are within required range, onset to puncture of index EVT are affected by time of transport from primary to complex cerebrovascular centre, door-to-image of second stroke is extended due to required transport, department of radiology and stroke unit are not in the same building within our hospital . (Table 2)

Average time in minutes	Index stroke	Second stroke
Door-to-image	17 (10 – 25)	28 (18 – 40)
Door-to-puncture	193 (86 – 322)	NA
Puncture-to-start of revascularisation	8 (4 – 15)	13 (4 – 23)
Puncture-to-revascularisation	13 (5 – 29)	14 (7 – 25)
Onset-to-puncture	255 (80 – 390)	111 (58 – 158)

Table 2. Time intervals in acute management of index and second stroke

Aspiration thrombectomy was predominantly used in all patients both in case of index and second stroke. When needed, we used PTA or placed a stent. As a rescue therapy, we used solumbra technique or intraarterial thrombolysis for the second stroke. (Figure 3)

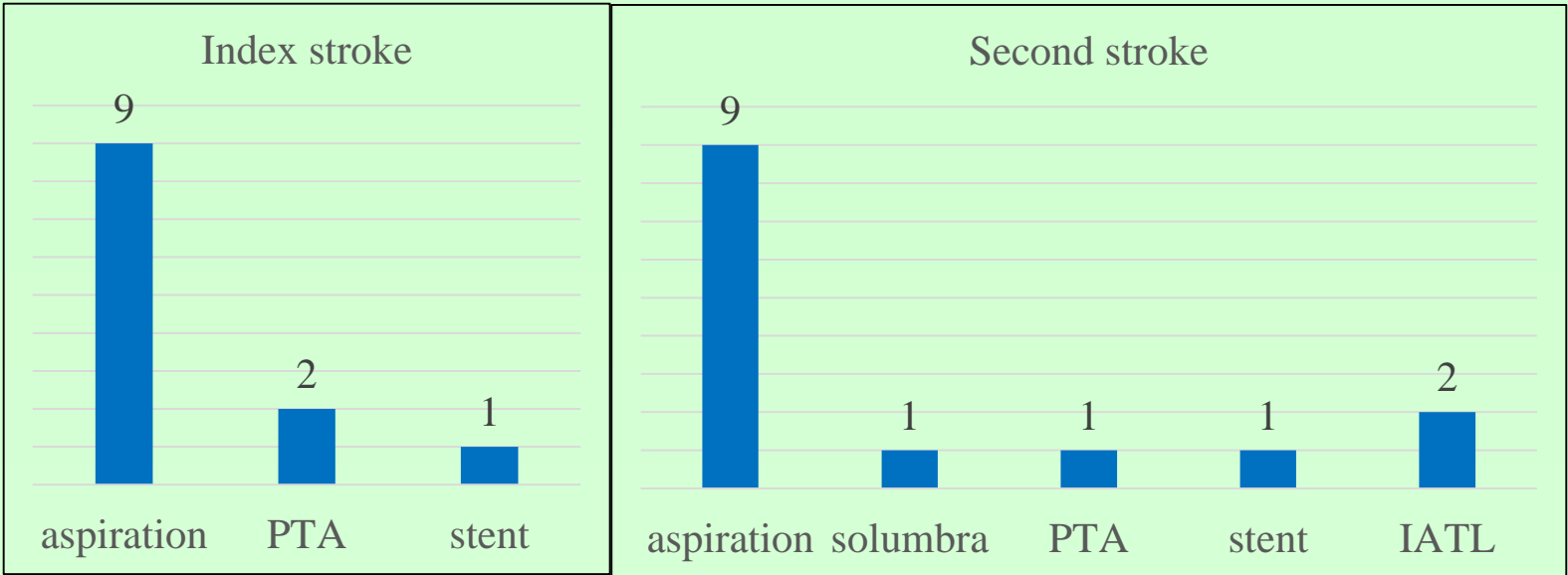


Figure 3. Overview of the treatment procedures

We have achieved successful recanalization for all patients for the index stroke and in 78% of the patients for the second stroke. (Table 3)

	Index stroke	Second stroke
TICI	n (%)	n (%)
3	8 (89%)	6 (67%)
2b	1 (11%)	1 (11%)
2a	0 (0%)	0 (0%)
1	0 (0%)	0 (0%)
0	0 (0%)	2 (22%)

Table 3. Recanalization rates

Safety of the EVT was based on results of clinical worsening and follow up CT scans. After the first stroke we have observed clinical worsening in one patient even after successful recanalization, brain CT revealed acute ischemic lesion without bleeding. One patient had remote bleeding type PHr1 without clinical worsening. After the second stroke, one patient died due to large intracranial bleeding type PH2. We did not register any clinical worsening within the first 24 hours after the second stroke. Acute ischemic lesion was found on follow-up CT in 4 patients after the first stroke and we did not see new ischemic lesion after the second stroke.

Clinical outcome was evaluated by mRs after 3 months. 3 patients (33,3%) were clinically independent, 2 patients (22,2%) had mRs 3-5 and 4 patients died (44,4%). This outcome is comparable to outcome of all patients treated in our cerebrovascular centre. (Figure 3)

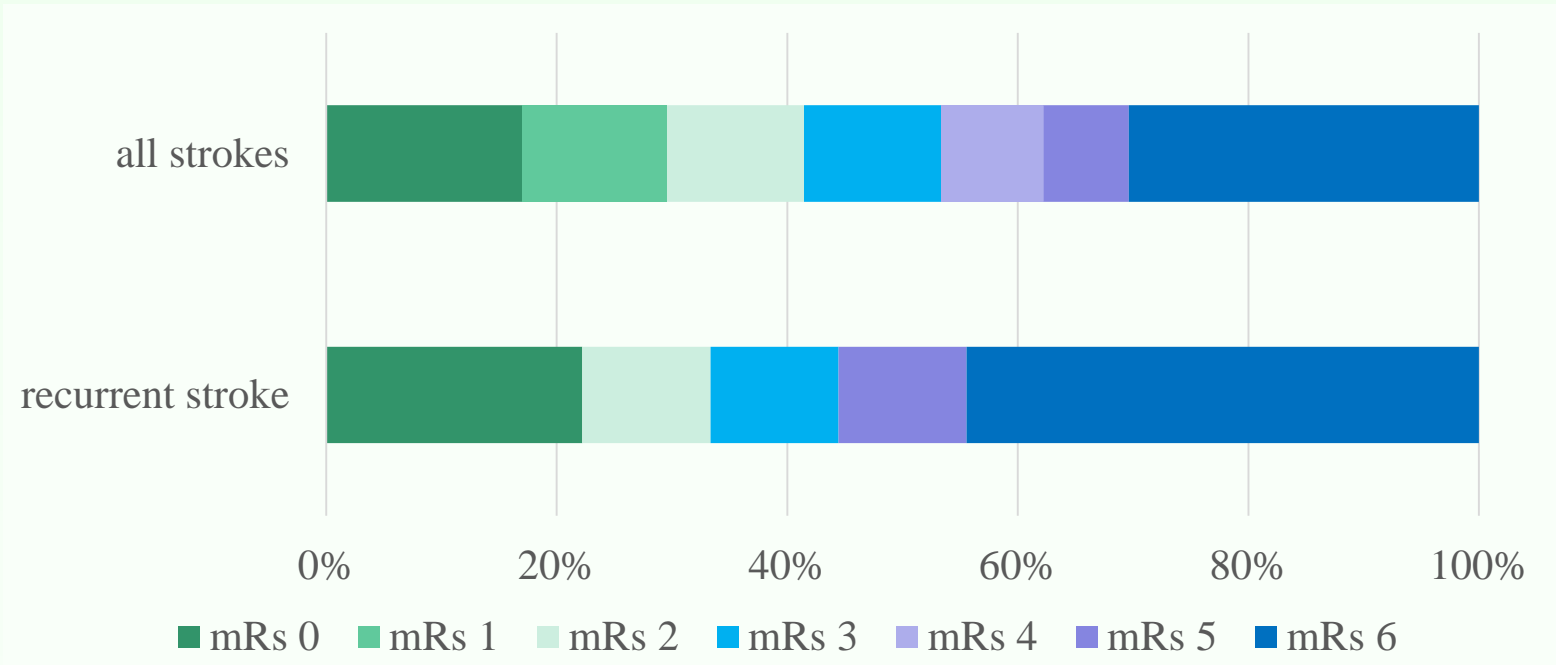


Figure 3 Comparison of clinical outcome after recurrent stroke with all strokes treated with EVT in our centre

Conclusion

Number of patients with ischemic stroke with confirmed LVO is increasing due to several reasons (improvement of prehospital and hospital management, fast identification and triage of patients, better cooperation of complex cerebrovascular centres and ambulance services, change in management of acute stroke patients). That is why we expect increase in frequency of recurrent EVT. According to available data repeated EVT seems to be safe and effective, risk of haemorrhagic complications and clinical outcome do not significantly differ from patients with single stroke. Based on this, stroke recurrence should not be contraindication for EVT and the management of these patients should be the same as for patients with single stroke. Because of small number of patients, another data are required to confirm effectiveness and safety of repeated EVT for LVO recurrence.

References :

- Goyal M, Menon BK, van Zwam WH, et al. HERMES collaborators: Endovascular thrombectomy after large-vessel ischaemic stroke: a meta-analysis of individual patient data from five randomised trials. Lancet 2016;387:1723-1731.
- Mohan KM, Wolfe CD, Rudd AG, Heuschmann PU, et al. Risk and cumulative risk of stroke recurrence: a systematic review and meta-analysis. Stroke 2011;42:1489-1494.
- Mordachini PJ, Kaesmacher J, Gautschi D, et al. Predictors of Unexpected Early Reocclusion After Successful Mechanical Thrombectomy in Acute Ischemic Stroke Patients. Stroke. 2018;49:2643-2651.
- Bouslama M, Haussen DC, Rebelo LC et al. Repeated Mechanical Thrombectomy in Recurrent Large Vessel Occlusion Acute Ischemic Stroke.Intervent Neurol 2017;6:1-7
- Mako M., Krastev G., Cisár J., et al.: Opakovaná mechanická trombektómia pri recidíve akútnej ischemickej cievnnej mozgovej príhody s oklúziou veľkej intrakraniálnej tepny. 46. Český a Slovenský Cerebrovaskulárny Kongres 12.-14.9.2018, Mikulov
- Chiu A, Pizzanelli C, Terri E, et al. A case of recurrent basilar artery occlusion successfully treated with repeated intravascular procedures. Neurologist 2011;17:95-97
- Lalibbe M, Möhlenbruch M, Hacke W, et al. Repeated intra-arterial thrombectomy within 72 hours in a patient with a clear contraindication for intravenous thrombolysis. Case Rep Vasc Med (2015);872817. doi:10.1155/2015/872817
- Fandler S, Deutschmann H, Fazekas F et al. Repeated Endovascular Treatment of Early Recurrent Proximal Middle Cerebral Artery Occlusion: Case Report and Brief Review of the Literature. Front. Neurol. 9:289