

# INTRAVENOUS THROMBOLYSIS IN A PATIENT WITH A CALCIFIED CEREBRAL EMBOLUS: A CASE REPORT

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## Abstract

**Background:** Recent clinical reports have been reported with information on the calcified cerebral embolus as a cause of acute ischemic stroke (AIS). Middle cerebral artery is considered as the most common site of calcified embolism. In the management of AIS, thrombolysis with intravenous tissue plasminogen activator (rt-PA) is still the preferred treatment. Results of rt-PA administration remain limited. The aim of this case report is to describe background, treatment and outcome of a 74-year-old female patient with acute onset of right central facial paralysis, moderate dysarthria, right hemiplegia, and a positive Babinski sign that started one hour prior to admission in the Department of Neurology in Clinical Hospital Tetovo. The patient's NIHSS (National Institutes of Health Stroke Scale) score was 23, and her MRS (Modified Rankin Score) was level 4. Initial non-contrast computer tomography of the head did not show for bleeding, no acute ischemic changes, but revealed a focus of calcification (maximum value of 320 HU). Patient after tissue plasminogen activator treatment showed symptomatic improvement (NIHSS score 12, MRS 3). Three months later, the patient's NIHSS score was 5, and her MRS was 2. She could manage all activities of daily living with assistance.

**Conclusion:** In this case, AIS can be attributed to the embolism resulting from the fragmentation of an already existing calcified embolus. This non-fresh blood clot may be one cause for the result of rt-PA administration in this case. The patient responded well to treatment, despite the additional interventions can be used in the future to aid in great improvements.

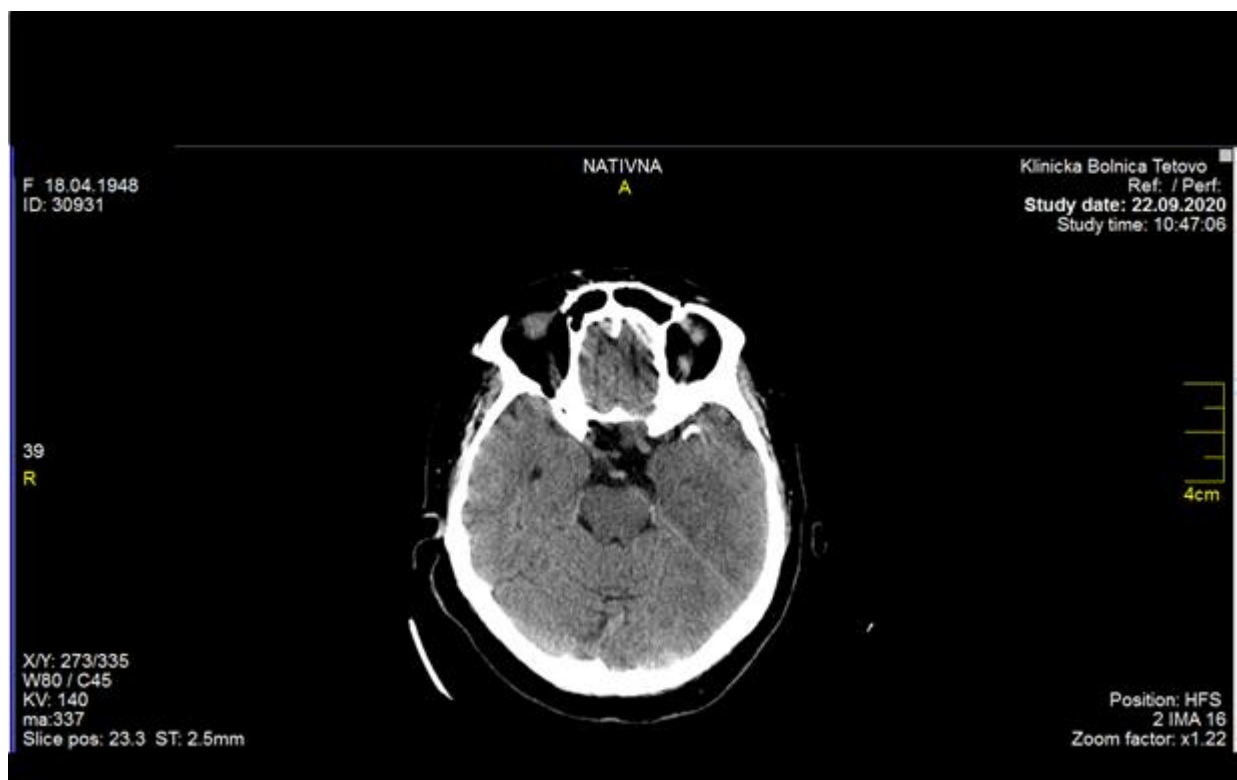
*Keywords:* ischemic stroke, calcified cerebral embolus

## 1. Introduction

Recent literature has reported information on the calcified cerebral embolus as a cause of stroke [Agarwal et al, 2020; Walker et al, 2014; Young et al, 2010]. Current international guidelines recommend intravenous thrombolysis for selected patients with an acute ischemic stroke (AIS) who can be treated within 3 h, and for highly selected patients who can be treated within 3-4.5 hours of symptom onset [Powers et al, 2019]. At present, thrombolysis with intravenous tissue plasminogen activator (rt-PA) is still the preferred treatment for patients with an AIS. Actilyse known as alteplase or recombinant tissue plasminogen activator, is the only recommended intravenous thrombolytic for the treatment of AIS [Demaerschalk et al, 2016; Fugate et al, 2015; Li Y et al, 2020]; however, reperfusion is successful in approximately half of patients who receive intravenous rt-PA [Li Y et al, 2020]. More recently, the restoration of blood flow by endovascular thrombectomy as a solution in a situation where the use of intravenous thrombolysis with alteplase is insufficient or contraindicated is also a therapy to change the prognosis of patients with ischemic stroke [Walker et al, 2014; Campbell et al, 2017]. This case report describes a patient with cerebral infarction in whom neurological function improved although non-fresh blood clot was not missing after intravenous administration of tissue plasminogen activator.

### 1.1. Case presentation

On September 22, 2020, a 74-year-old female with a history of hypertension and coronary atherosclerotic heart disease, presented with sudden-onset right-sided weakness and speech difficulty that started one hour prior to admission was admitted in the Department of Neurology in Clinical Hospital Tetovo, Tetovo, North Republic of Macedonia. Vital signs on presentation were as follows: heart rate 95 beats/min; blood pressure 170/85 mmHg; and respiratory rate 24 breaths/min. No abnormalities were evident from laboratory blood test that included blood count, blood glucose and coagulation. On neurological examination, she had right central facial paralysis, right hemiplegia (MRS-Modified Rankin Score, level 4), moderate dysarthria and a positive Babinski sign. The National Institutes of Health Stroke Scale (NIHSS) score was 23. Initial non-contrast computer tomography (NCCT) of the head showed no hemorrhage, no acute ischemic changes, and a focus of calcification (maximum density value of 320 HU) at the left middle cerebral artery territory (MCA), indicating possible left MCA territory infarction (Figure 1).



**Figure 1.** NCCT Head axial section shows calcified focus in left middle cerebral artery

Patient was diagnosed as suspected evolving ischemic stroke and since thrombectomy was not available, thrombolysis was discussed. When excluding absolute contraindications for intravenous thrombolysis, after communicating with patient family, thrombolysis was initiated with 0.9 mg/kg body weight rt-PA 1.5 hour post-onset with 10% bolus of the total dose given as initial loading, followed by administration of the remaining dose as an infusion over 1 hour. After alteplase administration, deficits progressively improved. Follow-up cerebral NCCT scan one day later revealed the hypo dense lesion compatible with left MCA infarction without any hemorrhagic transformation, but the non-fresh blood clot from patients who receive rt-PA therapy was present (Figure 2).



**Figure 2.** NCCT Head axial section done, one day after intravenous thrombolysis shows the presence of cerebral infarction and the calcified embolus unchanged in localization

Post-rt-PA NCCT of the head showed that the blood vessels were not re-occlude, but in the left frontal and left temporal lobes, and cortico-subcortically could be observed a hypo-dense area corresponding to an acute ischemic lesion as well as a calcified embolus at the origin of the superior division of left MCA. Also, the following day, the patient had improved neurological function, it had only dysarthria and mild paralysis in the right face and right side of the body, and its recalculated NIHSS score was 12. In repeated NCCT of the head (Figure 3) after one week of admission, the previous same changes were observed.



**Figure 3.** Repeat NCCT Head axial section done after 7 days confirmed the presence of cerebral infarction in the left frontal and temporal lobe and the calcified embolus at the left middle cerebral artery level

On the seventh day of admission, her neurological examination was improved and she was released home. At her 3-month s follow-up, she had only mild paresis of the face and right side of the body, and her reevaluated NIHSS score was only 5, and his Modified Ranking Score was 2.

## 2. Discussion

The patient in this report had histories of hypertension and coronary atherosclerotic heart disease for 19 and 11 years, respectively. She used aspirin and enalapril tablet continuously before stroke. Initial NCCT of the head did not show bleeding, and no acute ischemic changes, but revealed a focus of calcification. The data from the NCCT scan of the patient is in line with the finding that the presence of intracranial arterial calcification is usually accompanied by coronary atherosclerosis and is frequently observed in the intracranial arteries [Kassab et al, 2009] and patients with ischemic stroke [Bugnicourt et al, 2011]. There are assumptions that intra-arterial or intravenous thrombolytic leads to coagulation lysis by distal migration of its fragments [Yoon et al, 2010; Christian et al, 2009]. Looking at the localization and size of the calcified embolus in initial and repeat NCCT images of the head may suggest fragmentation of the calcified embolus and its distal migration. An embolism resulting from the fragmentation of an already existing calcified embolus may be a cause for the clinical manifestation of the AIS, as mentioned earlier in some cases [Yoon et al, 2010; Christian et al, 2009; Agarwal et al, 2020; Walker et al, 2014; Young et al, 2010]. The same calcified embolus as a non-fresh blood clot may be one of the most important reasons for not achieving complete the result of rt-PA administration in this case report, as suggested in some cases [Li Y et al, 2020]. Some previous reports have reported information that any segment of the thrombus could express the overall characteristics [Agarwal et al, 2020; Staessens et al, 2020]. Calcified cerebral embolus in MCA as a cause of AIS [Agarwal et al, 2020] can reduce the effect of thrombolytic [Walker et al, 2014]. Some of the

explanations are related to the relationship between thrombus ultrastructure and thrombolysis resistance [Li Y et al, 2020] or spontaneous migration of the calcified thrombus, rather than its fragmentation [Agarwal et al, 2020; Walker et al, 2014; Young et al, 2010]. In this case report, the patient after tissue plasminogen activator treatment showed symptomatic improvement. A similar outcome has been reported by other authors [Walker et al, 2014; Gokhale et al, 2013; Halloran et al, 2004; Kissela et al, 2001].

### **3. Conclusions**

AIS in patient may be attributed to the embolism resulting from the fragmentation of an already existing calcified embolus. The same calcified embolus was probably responsible for the outcome of rt-PA administration in this case. The patient responded well to treatment, despite additional interventions can be used in the future to aid in greater improvements.

### **Limitation**

One limitation should be mentioned in this case report. This case report only analyzed one clinical case, thus, it is difficult to draw a firm conclusion, and a further study with a larger sample size is needed to confirm this present finding.

### **Author Agreement**

Written informed consent was obtained from the son of the patient for the publication of any potentially identifiable images or data included in this case report.

The author declares that this case report was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest findings.

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