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Case report
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BASILAR ARTERY OCCLUSION TREATED WITH MECHANICAL THROMBECTOMY IN EXTENDED TIME WINDOW USING DIFFUSION-WEIGHTED IMAGING/FLUID ATTENUATED INVERSION RECOVERY MISMATCH – A CASE REPORT

OKLUZIJA BAZILARNE ARTERIJE LEČENE MEHANIČKOM TROMBEKTOMIJOM U PRODUŽENOM VREMENSKOM PROZORU KORIŠĆENJEM DIFUZNOG TENZORSKOG IMIDŽINGA/FLUIDNO ANTENUIRANE INVERZIJSKE NEPODUDARNOSTI OPORAVKA – PRIKAZ SLUČAJA

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Summary
Introduction. There are individual case reports and case-series in the literature that have applied diffusion-weighted imaging/fluid attenuated inversion recovery mismatch and intravenous thrombolytic therapy in the treatment of posterior circulation strokes. This case report demonstrates the use of diffusion-weighted imaging/fluid attenuated inversion recovery mismatch in the treatment of basilar artery occlusion with mechanical thrombectomy. **Case Report**. A 68-year-old male patient presented with a wake-up stroke and a National Institutes of Health Stroke Scale score of 14. Computed tomography angiography showed an occlusion of the basilar artery. Diffusion-weighted imaging/fluid attenuated inversion recovery mismatch was established and mechanical thrombectomy was performed. Complete reperfusion was achieved. Mechanical thrombectomy was performed in the 16th hour from the onset of symptoms. After the intervention, the patient's National Institutes of Health Stroke Scale score was 9. The patient was discharged without any neurological symptoms and a score of 0 on the modified Rankin Scale. **Conclusion.** Diffusion-weighted imaging/fluid attenuated inversion recovery mismatch may be a useful criterion for the selection of patients with basilar artery occlusion and unknown-onset strokes who are to be treated with mechanical thrombectomy.
Key words: Stroke; Basilar Artery; Arterial Occlusive Diseases; Thrombectomy; Diffusion Magnetic Resonance Imaging; Predictive Value of Tests

Sažetak
Uvod. U literaturi postoje individualni prikazi slučaja i serije slučaja koji su primenjivali difuzioni tenzorski imidžing/fluidno-atenuiranu inverzijsku nepodudarnost oporavka i intravensku trombolitičku terapiju u lečenju moždanog udara zadnje cirkulacije. Ovaj prikaz slučaja demonstrira primenu difuzionog tenzorskog imidžinga/fluidno-atenuiranu inverzijsku nepodudarnost oporavka lečenju okluzije bazilarne arterije uz pomoć mehaničke trombektomije. **Prikaz slučaja**. Muškarac, starosti 68 godina, imao je moždani udar pri buđenju, sa skorom 14 na Skali za moždani udar Nacionalnog instituta za zdravlje. Kompjuterizovana tomografska angiografija je pokazala okluziju bazilarne arterije. Utvrđeno je postojanje difuzionog tenzorskog imidžinga/fluidno-atenuirana inverzijska nepodudarnost oporavka i sprovedena je mehanička trombektomija. Postignuta je potpuna rekanalizacija. Mehanička trombektomija je načinjena u 16. satu od početka simptoma. Nakon intervencije, skor na Skali za moždani udar Nacionalnog instituta za zdravlje bio JE 9. Pacijent je otpušten bez neuroloških simptoma; na modifikovanoj Rankinovoj skali. **Zaključak**. Difuzioni tenzorski imidžing/fluidno-atenuirana inverzijska nepodudarnost oporavka može biti koristan kriterijum za selekciju pacijenata sa okluzijom bazilarne arterije i nepoznatim vremenom moždanog udara, koji bi bili lečeni mehaničkom trombektomijom.
Ključne reči: moždani udar; bazilarna arterija; arterijske okluzivne bolesti; trombektomija; difuziona magnetna rezonanca; prediktivna vrednost testova

Introduction

Occlusion of the basilar artery (BA) and brainstem strokes have a high rate of morbidity and mortality [1]. Nowadays, there are confirmatory trials pointing how to identify patients with wake-up stroke eligible for thrombolysis using magnetic resonance imaging (MRI) [2] and patients eligible for mechanical thrombectomy in extended time window using perfusion imaging [3, 4], but all trials were done including only anterior circulation. We present a case of a patient with BA occlusion and wake-up stroke treated with mechanical thrombectomy (MT) along with diffusion-weighted imaging (DWI)/fluid attenuated inversion recovery (FLAIR) mismatch.

Case Report

A 68-year-old male patient was admitted to the Emergency Department with wake-up stroke 10 hours

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Abbreviations

BA	– basilar artery
MRI	– magnetic resonance imaging
MT	– mechanical thrombectomy
DWI	– diffusion-weighted imaging
FLAIR	– fluid attenuated inversion recovery
NIHSS	– National Institutes of Health Stroke Scale
CT	– computed tomography
CTA	– computed tomography angiography

after he was last seen well. The patient had posterior circulation symptoms, National Institutes of Health Stroke Scale (NIHSS) 14, Glasgow coma scale 12. Hyperdense sign of basilar artery was seen on the non-enhanced computed tomography (CT) **(Figure 1a)**,

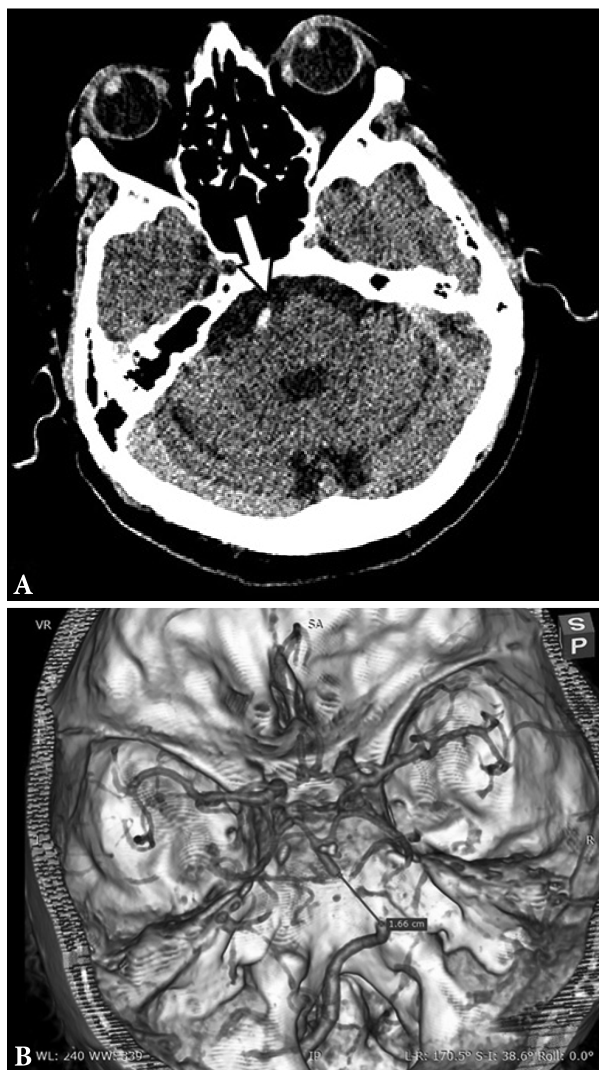

Figure 1. A) Non-contrast CT - hyperdense sign of basilar artery (arrow); B) CTA 3D reconstruction showing the basilar artery occlusion of 1.6 cm in length

Slika 1. *A) Nativna kompjuterizovana tomografija – Hiperdenzni znak bazilarne arterije (strelica); B) 3D rekonstrukcija kompjuterizovane tomografske angiografije sa mestom okluzije bazilarne arterije u dužini od 1,6 cm*

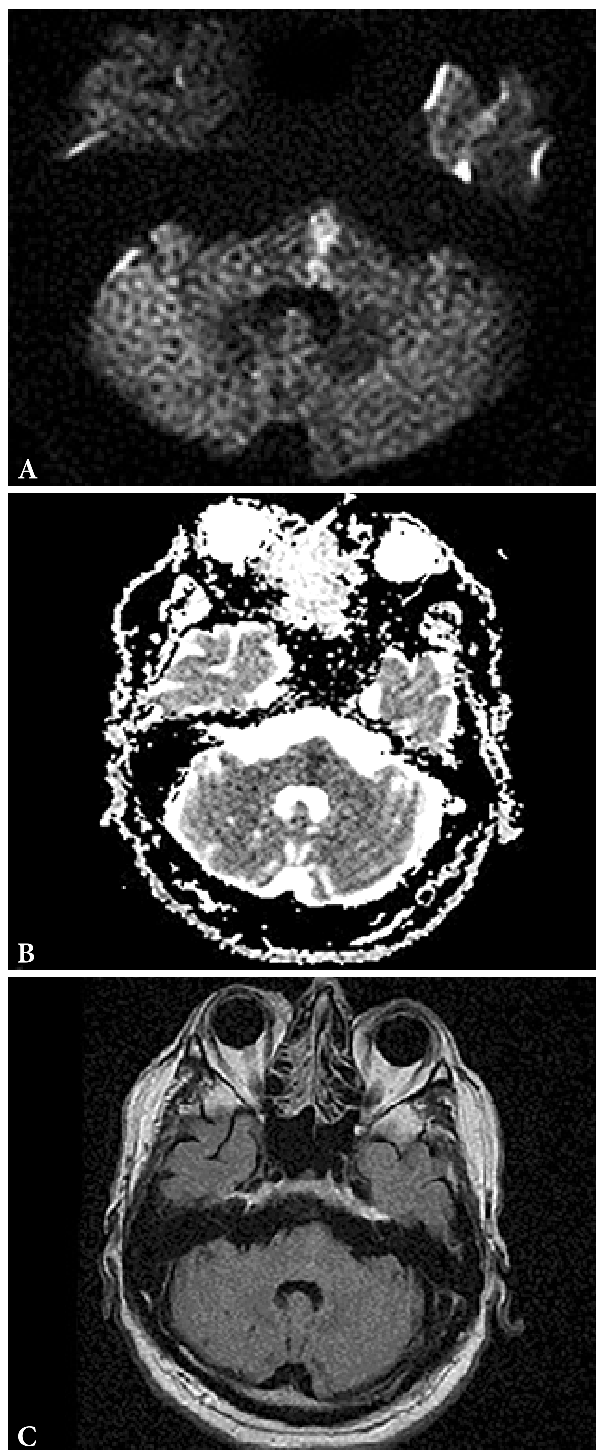

Figure 2. DWI-FLAIR mismatch: A) DWI signal hyperintensity in the left side of pons; B) Apparent diffusion coefficient map with a corresponding hypointense pontine zone; C) FLAIR without a hyperintense signal in the pons region

Slika 2. *DWI-FLAIR nepodudaranje: A) DWI hiperintezni signal u predelu levog hemiaspekta ponsa; B) Mapa vrednosti difuzionog koeficijenta sa odgovarajućom hipointenznom pontinskom zonom; C) FLAIR sekvenca bez izmene signala u predelu ponsa*

strongly indicative of acute blood vessel thrombosis. Computed tomography angiography (CTA) confirmed BA occlusion **(Figure 1b)**. Magnetic resonance imaging (MRI) was performed next, showing an area of restricted diffusion on DWI on the left side of the pons **(Figure 2a)**, without FLAIR signal hyperintensity **(Figure 2c)**, confirming DWI-FLAIR mismatch. A MT was done, 16 hours after patient was seen well, using both aspiration and stent retriever, and modified treatment in cerebral ischemia score 3 was achieved. The NIHSS score after the procedure was 9, and after 24 hours it was 2, while the patient had only mild right hemiparesis. The patient was prescribed a direct oral anticoagulant for secondary prevention, and at discharge his NIHSS and modified Rankin scale were 0.

Discussion

In Vojvodina, MT was introduced as a standard operative procedure for acute stroke treatment due to large vessel occlusion in 2016 [5]. We present a patient with wake-up stroke due to BA occlusion, with DWI-FLAIR mismatch, treated with MT. Wake-up strokes are common in everyday practice, and can be met in up to 44% of all stroke cases [6]. The DWI-FLAIR mismatch can be used for identifying patients eligible for thrombolysis whose symptoms onset was within 4.5 hours, even if the time of onset is unknown [7, 8]. This mismatch has not been used in larger trials for patient assessment and MT.

Posterior circulation is rich in collaterals and anastomotic channels, as pons specifically receives blood supply from proximal and middle segments of BA branches [1]. In accordance with these statements, our patient probably had good collateral circulation status that kept him FLAIR-negative even after 15 hours (when MRI was done) from last seen well.

The DWI-FLAIR mismatch may be useful in the assessment of patients with posterior circulation strokes with unknown-onset because the affected territory is smaller than in anterior circulation, so MRI must always be used due to its higher resolution, sensitivity, and specificity for ischemic events than CT. In addition, there are no optimized diagnostic tools to detect the penumbra zone with perfusion modalities because the brainstem, cerebellum and posterior cerebral artery territory receives a small blood supply volume [9]. This is why DEFUSE 3 and DAWN trial criteria are not fully applicable for brainstem infarctions. Also, patient selection without using perfusion and/or semi-automated software is reproducible and feasible in many centers [2].

Conclusion

We have shown that mechanical thrombectomy may be used for the treatment of basilar artery occlusion beyond 6 hours from the onset of symptoms and with diffusion-weighted imaging/fluid attenuated inversion recovery magnetic resonance imaging mismatch, but further research and randomized controlled trials are needed for this kind of treatment to be included in future recommendations.

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