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Direct traumatic carotid cavernous fistula; angiographic classification and treatment strategies: Study of 172 cases

Objectives: We report our experience in treatment of traumatic direct carotid cavernous fistula (CCF) via endovascular intervention. We hereof recommend an additional classification system for type A CCF and suggest respective treatment strategies.

Methodology: Only type A CCF patients (Barrow's classification) would be recruited for the study. Based on the angiographic characteristics of the CCF, we classified type A CCF into three subtypes including small size, medium size and large size fistula depending on whether there was presence of the anterior carotid artery (ACA) and/or middle carotid artery (MCA). Angiograms with opacification of both ACA and MCA were categorized as small size fistula. Angiograms with opacification of either ACA or MCA were categorized as medium size fistula and those without opacification of neither ACA nor MCA were classified as large size fistula. After the confirm angiogram, endovascular embolization would be performed promptly using detachable balloon, coils or both. All cases were followed up for complication and effect after the embolization.

Results: A total of 172 direct traumatic CCF patients were enrolled. The small size fistula was accountant for 12.8% (22 cases), medium size 35.5% (61 cases) and large size fistula accountant for 51.7% (89 cases). The successful rate of fistula occlusion under endovascular embolization was 94% with preservation of the carotid artery in 70%. For the treatment of each subtype, a total of 21/22 cases of the small size fistulas were successfully treated using coils alone. The other single case of small fistula was defaulted. Most of the medium and large size fistulas were cured using detachable balloons. When the fistula sealing could not be obtained using detachable balloon, coils were added to affirm the embolization of the cavernous sinus via venous access. There were about 2.9% of patient experienced direct carotid artery puncture and 0.6% puncture after carotid artery cut-down exposure. About 30% of cases experienced sacrifice of the parent vessels and it was associated with sizes of the fistula. Total severe complication was about 2.4% which included one death (0.6%) due to vagal shock; one transient hemiparesis post-sacrifice occlusion of the carotid artery but the patient had recovered after three months; one acute thrombus embolism and the patient was completely saved with recombinant tissue plasminogen activator (rTPA); one balloon dislodgement then got stuck at the anterior communicating artery but the patient was asymptomatic.

Conclusion: Endovascular intervention as the treatment of direct traumatic CCF had high cure rate and low complication with its ability to preserve the carotid artery. It also can supply flexible accesses to the fistulous site with various alternative embolic materials. The new classification of type A CCF based on angiographic features was helpful for planning of the embolization. Coil should be considered as the first embolic material for small size fistula meanwhile detachable balloons was suggested as the first-choice embolic agent for the medium and large size fistula.

Biography

Cuong Tran Chi is a Medical Director of Stroke International Services System, Vietnam. He is the President of Interventional Neuroradiology Society of HCM city, Vietnam and Senior Consultant of Interventional Neuroradiology of Vietnam. He has been a member of World Federation of Interventional and Therapeutic Neuroradiology (WFITN) since 2007. He has performed more than 2000 Neuro-interventional procedures including: Carotid cavernous fistula, intracranial and spinal dural fistula, and treatment aneurysm by coiling, treatment AVM, carotid stenting and intracranial stenting, flow-diverter stenting and percutaneous vertebroplasty.

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