Raymond-Roy Occlusion Classification

- Angiographic Occlusion After Flow Diversion of Ruptured and Unruptured Intracranial Aneurysms Using the Flow Redirection Endoluminal Device-X: A Multicenter Analysis
- Endovascular Treatment of Wide-Neck Intracranial Aneurysms Using the Novel Contour Neurovascular System: 5-Year Follow-Up
- Assessing Occlusion and Recovery in Large and Giant Intracranial Aneurysms: A Comparative Retrospective Study of Flow Diversion Alone Versus Combined With Coiling and the Role of Packing Density
- Simplified volume embolization ratio calculation method in endovascular coiling for unruptured cerebral aneurysms
- Interdependence of First-coil and Global volume embolization ratios (VERs) calculated by Sim&Size in predicting aneurysm occlusion outcomes
- Risk factors for recanalization after coil embolization for cerebral aneurysms: importance of the first coil and prediction model
- Comparative analysis between stent-assisted coiling and Woven EndoBridge embolization for unruptured wide-necked bifurcation intracranial aneurysms: A propensity score matching study
- Efficacy and Safety of Adjunctive Coiling in Pipeline Embolization Device Implantation for Small- and Medium-Sized Unruptured Cerebral Aneurysms: A Retrospective Cohort Study and Literature Review

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The Raymond–Roy occlusion classification (RROC) is an angiographic classification scheme for grading the occlusion of intracranial aneurysm endovascular treatment [1)]

The Raymond-Roy Occlusion Classification, also known as the Montreal scale has been the most widely used, and it classifies the results after aneurysm coiling, which can be applied immediately after the treatment as well as during the follow-up [2)].

This classification categorizes the occlusion into three grades:

Grade 1 (Complete Occlusion): No contrast filling within the aneurysm sac. The contrast material is completely blocked, indicating complete closure of the aneurysm.

Grade 2 (Residual Neck): Some contrast enters the aneurysm, but there is limited filling, primarily confined to the neck of the aneurysm. This indicates incomplete occlusion with some residual filling in the neck region.

Grade 3 (Residual Aneurysm): Contrast fills the aneurysm sac to a degree that is more than just the neck. This suggests incomplete occlusion with significant residual filling within the aneurysm sac.

The Raymond-Roy Occlusion Classification is valuable for assessing the effectiveness of endovascular coiling in treating intracranial aneurysms. A higher grade indicates a greater degree of residual filling, which may require further intervention or close monitoring.

Unfortunately, this scale is inadequate for describing aneurysms treated with flow diverting stents. Residual or complete filling of the aneurysm is very common immediately after technically successful flow diversion but is not common after technically successful endosaccular treatment. A small neck remnant at follow-up is often accepted as an adequate treatment after aneurysm coiling, whereas slight filling of an aneurysm treated with a flow-diverting stent may be enough to perpetuate continued mass effect, progressive aneurysm growth and in some cases spontaneous rupture. Finally, a simple assessment of the degree of filling does not take into account the dynamic nature of the contrast stasis and its potential role in predicting aneurysm closure over time. To address these issues, we propose a novel grading scale for the assessment of aneurysms treated with flow diversion. This simple scale accounts for both the amount of aneurysm filling and the degree of contrast stasis seen. We hope this scale will standardize the communication of clinical results with flow diversion. We further anticipate that the simultaneous grading of both filling and stasis will facilitate future research and analysis of flow-diverting interventions [3)].

In a retrospective review of 370 patients with 390 intracranial aneurysms treated with coil embolization. A Modified Raymond-Roy Classification (MRRC), in which Class IIIa designates contrast within the coil interstices and Class IIIb contrast along the aneurysm wall, was applied retrospectively.

Class IIIa aneurysms were more likely to improve to Class I or II than Class IIIb aneurysms (83.34% vs 14.89%, p<0.001) and were also more likely than Class II to improve to Class I (52.78% vs 16.90%, p<0.001). Class IIIb aneurysms were more likely to remain incompletely occluded than Class IIIa aneurysms (85.11% vs 16.67%, p<0.001). Class IIIb aneurysms were larger with wider necks while Class IIIa aneurysms had higher packing density. Class IIIb aneurysms had a higher retreatment rate (33.87% vs 6.54%, p<0.001) and a trend toward higher subsequent rupture rate (3.23% vs 0.00%, p=0.068).

Mascitelli et al., propose the MRRC to further differentiate Class III aneurysms into those likely to progress to complete occlusion and those likely to remain incompletely occluded or to worsen. The MRRC has the potential to expand the definition of adequate coil embolization, possibly decrease procedural risk, and help endovascular neurosurgeons predict which patients need closer angiographic follow-up. These findings need to be validated in a prospective study with independent blinded angiographic grading [4)].

Modified Raymond-Roy Occlusion Classification

Modified Raymond-Roy Occlusion Classification.

Cekirge-Saatci classification

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Aneurysm Recanalization Stratification Scale

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1)
Mascitelli JR, Moyle H, Oermann EK, Polykarpou MF, Patel AA, Doshi AH, Gologorsky Y, Bederson JB, Patel AB. An update to the Raymond-Roy Occlusion Classification of intracranial aneurysms treated with coil embolization. J Neurointerv Surg. 2015 Jul;7(7):496-502. doi: 10.1136/neurintsurg-2014-011258. Epub 2014 Jun 4. PMID: 24898735.
2)
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3)
O'kelly CJ, Krings T, Fiorella D, Marotta TR. A novel grading scale for the angiographic assessment of intracranial aneurysms treated using flow diverting stents. Interv Neuroradiol. 2010 Jun;16(2):133-7. Epub 2010 Jul 19. PubMed PMID: 20642887; PubMed Central PMCID: PMC3277972.
4)
Mascitelli JR, Moyle H, Oermann EK, Polykarpou MF, Patel AA, Doshi AH, Gologorsky Y, Bederson JB, Patel AB. An update to the Raymond-Roy Occlusion Classification of intracranial aneurysms treated with coil embolization. J Neurointerv Surg. 2014 Jun 4. pii: neurintsurg-2014-011258. doi: 10.1136/neurintsurg-2014-011258. [Epub ahead of print] PubMed PMID: 24898735.