

# Internuclear ophthalmoplegia following radial artery cardiac catheterization approach: An unusual presentation

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## Abstract:

Internuclear ophthalmoplegia (INO) may happen following percutaneous coronary intervention and angiography. However, no reports of INO during radial artery angioplasty were reported yet. We report a rare case in a 47-year-old man presenting with diplopia after radial artery angioplasty. Although the symptoms were resolved after 60 days, diagnosing this obstacle is necessary to reduce the patient and physician's anxiety.

## Keywords:

Cardiac catheterization, diplopia, internuclear ophthalmoplegia, nystagmus

## INTRODUCTION

Coronary atherosclerosis is the most common cause of mortality and morbidity in the developed countries. Therefore, therapeutic and diagnostic cardiac catheterization is an ordinary cardiac procedure performed that is relatively safe and does not usually come with major risks.<sup>[1]</sup>

Coronary intervention through catheterization by either radial or femoral access is used to improve blood flow and decrease the mortality in acute coronary syndrome patients. The transfemoral approach was considered the main route of arterial access for cardiac catheterization before 2008, in the United States. However, the transradial approach become very popular worldwide and is becoming more accepted in the recent years, based on a reduction in vascular complications and mortality compared with the transfemoral approach.<sup>[2,3]</sup> However, both vascular access may lead to cerebral embolic risks based on different mechanisms.

Internuclear ophthalmoplegia (INO) following cardiac catheterization happens to some extent that may be under-recognized due to spontaneous recovery of the disease.<sup>[4]</sup> The

underlying pathophysiology is thought to be microembolization during the approach and not the coronary artery procedure *per se* because the coronary arteries supply the heart and do not supply the brainstem (medial longitudinal fasciculus [MLF]) and cannot cause an INO directly.

However, due to worrying disorder for the patient and also due to the rare presentation of this complication, this is a debatable issue for physicians. To the best of our knowledge, this is the first reported case in the literature and only radial approach cardiac catheterization-related INO. This report may imply that during radial approaches, the risk of microembolization could be considered.

## CASE REPORT

A 47-year-old man, with 20-year background of hypertension, had originally presented with unstable angina to the emergency department. He was under treatment of daily tablet losartan 25 mg and 80 mg ASA tablet without any history of surgery or underlying disease. A significant stenosis in the proximal part of the diagonal artery was diagnosed. He underwent a 30-min cardiac catheterization and angiography through the right radial artery with local anesthesia using lidocaine 2%. No sign of stenosis was seen after the procedure.

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The patient referred to the ophthalmology service with diplopia, which manifested immediately following the procedure. An ocular examination revealed no sign of nystagmus, ptosis, or pupillary involvement, but exotropia of the right eye was seen in primary gaze. The eye movement was normal except a limitation in adduction of the right eye [Figure 1 indicating an incomplete third nerve palsy in its inferior division]. No other neurologic findings: no focal weakness, focal numbness, dysphagia, dysarthria, aphasia, or ataxia was detected. The brain magnetic resonance imaging (MRI) reported abnormal signal intensity (low in apparent diffusion coefficient and high in diffusion-weighted imaging) in the pons (right para-midline) compatible with diffusion restriction due to acute infarction [Figure 2]. One day after the procedure, a computed tomography (CT) angiography of the carotid arteries showed a calcified plaque with mild stenosis at the cavernosal portion of both internal carotid artery (ICA), and the right ICA had retropharyngeal course. In addition, the CT angiography of the circle of Willis demonstrated a calcified plaque with mild stenosis at the distal portion of the both vertebral arteries, that revealed the right posterior cerebral artery caused by the ICA instead of the basilar artery, a common anatomic variation in the circle of Willis, called fetal-type posterior cerebral artery.<sup>[1]</sup> Furthermore, orbital MRI did not show any lesion, including tumor, infection, or inflammation in the orbit and anterior to the cavernous sinus region. Due to diplopia, an eye patch was applied. In her follow-up appointment, the patient denied recurrent angina symptoms, and her diplopia had resolved. The patient's symptoms improved spontaneously after 2 months of administration of 325 mg daily aspirin tablets.

## DISCUSSION

Previous data were conflicting regarding the cerebral embolic risks of different vascular access. In one side, the study of Omran *et al.*<sup>[5]</sup> revealed a 25% of cerebral embolization at diffusion-weighted MRI after transfemoral retrograde left heart that could be dislodged by catheters and wire coming from the femoral artery, that scrape the abdominal and descending aorta, spared on the other hand by the right radial approach. On the other side, the right transradial approach demonstrated an increase in the manipulation of catheters in the ascending

aorta and found a higher risk of direct embolization into the right common carotid artery (CCA), whereas it could reduce the amount of brain emboli by avoiding mechanical trauma to the aortic wall caused by catheters and wire.

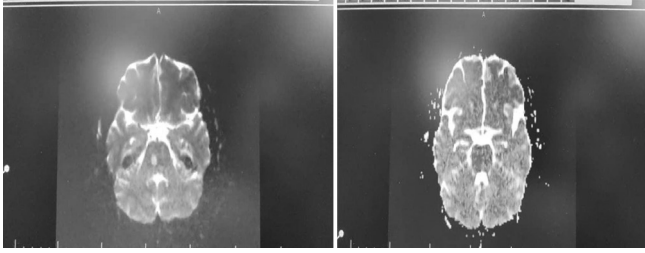
Furthermore, the recent randomized study comparing the right radial versus femoral artery approach showed an increased incidence of microembolic signals in the right radial group. This was explained by navigation through the tortuous and atheromatous innominate artery and direct debris embolization into the right CCA.<sup>[6]</sup> Similarly, Lund *et al.*<sup>[7]</sup> reported right radial access almost doubled the number of solid microembolic signals compared to femoral access, with a higher rate of microembolization into the right CCA both during catheter exchange and coronary examination. In addition, the origin of the right CCA offers an easy way for direct brain embolization of debris generated along the innominate artery. Hence, the increased length of the procedure could provide an additional time for the catheter to act directly as an embolic source of blood clots. Therefore, the anatomy of supra-aortic vessels and their anatomic relationship with the ascending aorta and aortic arch may play the key factors to explain our results.

The neurological complications following percutaneous coronary intervention and angiography are not common; however, an unpleasant complication could affect the quality of life of the patient.<sup>[4,8]</sup> Some of these complications include transient ischemic attack, cerebral vascular accidents, migraines, seizures, transient femoral nerve palsy, and also visual involvements.<sup>[4,9,10]</sup> Several visual symptoms are caused by lateral rectus palsy, including diplopia, visual loss, ptosis, mydriasis, INO, and cortical blindness.<sup>[9]</sup>

INO following radial access cardiac catheterization is not reported yet, but nystagmus of the abducting eye and preserved convergence are common clinical findings in INO. In other word, the slowed cardinal sign of a unilateral INO can be observed adducting saccadic velocity in one eye, commonly linked to abducting nystagmus of the fellow eye. The slowed adducted eye is associated with a complete or limited range of adduction.<sup>[11]</sup> Contrary to all reports of INO, in our patient, there was no nystagmus after all angiography, and this may be the first case of INO without nystagmus.



**Figure 1:** (a) The patient in primary central gaze. (b) The patient in right gaze, no deviation. (c) The patient in left gaze, with right exotropia. (d) The patient in inferior gaze, no deviation. (e) The patient in superior gaze, no deviation



**Figure 2:** Abnormal signal intensity (high in DWI and low in ADC) in the pons. DWI: Diffusion-weighted imaging, ADC: Apparent diffusion coefficient

In a report by Eggenberger *et al.*, all patients with diplopia recovered during 82 days.<sup>[4]</sup> In our patient, the patient's diplopia improved in <50 days. Although ocular complications were rare after cardiac catheterization using angiography through the right radial artery, it may reveal the fact that accurate and timely diagnosis can help both the patient and the treatment staff.

Neuroimaging may fail to reveal a lesion due to the limited extent of the infarction in these cases. It has been reported that the neurologic events associated with cardiac catheterization involve the vertebrobasilar circulation in over 50% of patients, as in our case that distal portion of both vertebral arteries and cavernosal portion of both ICA are involved. In addition, studies have shown that the fetal-type posterior cerebral artery, like what was seen in our case, is an independent risk factor for cerebral vascular involvements like intracranial aneurysm.<sup>[1]</sup>

Moreover, following the angiography and percutaneous coronary intervention, ischemic event to the division of the third nerve that innervates the right medial rectus muscle may occur that could be secondary to cerebral vessels emboli caused by the dislodgement of an atheromatous plaque that may explain our finding.

In conclusion, however, the right radial route of cardiac catheterization may rarely cause INO and ischemia of the MLF following microembolization, the prognosis of these patients is very good as most are asymptomatic in a matter of months.

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## Conflicts of interest

There are no conflicts of interest.

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