Cervical arterial dissections: differential diagnosis.

INTRODUCTION

Cervical artery dissection (CAD) should be differentiated from cardioembolism, atherosclerosis, radiation treatment, vasculitis, fibromuscular dysplasia, dysgenesis of the internal carotid artery. The echocolor Doppler findings in some cases may be similar.

The clinic is very important for the differential diagnosis: it is necessary to keep in mind that CAD is a common cause of stroke in young and middle-aged patients and pain is usually the initial manifestation (the characteristic unilateral headache develops in 2/3 of patients).

In particular, in case of echocolor Doppler "stump flow" in the proximal ICA (dissection non-specific sign), the presence of laterocervical sudden pain, or headache, persistent and the absence of carotid atherosclerotic disease (CAD is a common cause of stroke in young, non atherosclerotic patients) are very useful for the differential diagnosis between dissection and obstruction of the distal ICA to other causes (cardioembolism or atherosclerotic occlusion of the distal cervical ICA).

In this lesson the echocolor Doppler differential diagnosis of the cervical arterial dissections are presented.
CAD DISSECTION
DIFFERENTIAL DIAGNOSIS

US DIFFERENTIAL DIAGNOSIS

A) “STUMP FLOW”
- cardioembolism
- atherosclerotic occlusion of the distal cervical ICA

B) OTHER CAUSES OF ARTERIAL WALL THICKENING
- atherosclerosis of the carotid bulb and the bifurcation
- vasculitis
- radiation treatment

C) EXTRACRANIAL ICA ANEURYSM

E) DYSGENESIS OF THE ICA
CAD DISSECTION
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CAD DISSECTION D.D
STUMP FLOW

- in presence of US "indirect" signs (stump flow) is imposed the dd with acute occlusion of the distal ICA obstruction due to other causes:
  - atherosclerosis
  - cardioembolism
"stump flow" (US non-specific sign):

1. dissection?
2. atherosclerosis?
3. cardioembolism?
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<table>
<thead>
<tr>
<th>Subtype</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Large-artery atherosclerosis (intra-extracranial)</td>
<td>17%</td>
</tr>
<tr>
<td><strong>CARDIOEMBOLISM</strong></td>
<td>21%</td>
</tr>
<tr>
<td>Small-vessel occlusion</td>
<td>30%</td>
</tr>
<tr>
<td>Other or undetermined etiology</td>
<td>31%</td>
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</tbody>
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ACUTE ISCHEMIC STROKE SUBTYPE CLASSIFICATION

CARDIOEMBOLISM

- CARDIAC US TT OR TE: presence of cardioembolic sources of high and medium risk
- CT or MRI: ischemic areas in multiple vascular territories
- U.S.: stenosis <50% in both internal carotid arteries

TOAST classification of Subtypes of acute Ischemic Stroke. Stroke 1993
CARDIOEMBOLISM

ICA: non hemodynamic plaque

MCA: M2 occlusion

cardioembolic stroke 1 (typical)
- CARDIAC US TT/TE: cardioembolic sources of high and medium risk
- CT or MRI: ischemic areas in multiple vascular territories
- U.S.: stenosis <50% in both internal carotid arteries
CAD DISSECTION D.D.
CARDIOEMBOLISM

cardioembolic stroke 2: (less frequent)
“stump flow” due to occlusion of the distal cervical ICA, siphon, MCA in FFA

“stump flow” indicate the possibility of cardioembolic stroke in an appropriate US/NR/clinical setting. Dissection d.d.:  
- CARDIAC US TT/TE: cardioembolic sources of high and medium risk  
- CT or MRI: ischemic areas in multiple vascular territories  
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CAD DISSECTION D.D

STUMP FLOW

atherosclerotic occlusion of the distal cervical ICA

“stump flow” indicate the possibility of atherosclerosis in a appropriate US/clinical setting. Dissection d.d.:

- usually occurs in the elderly
- usually US signs of atherosclerosis are present in other districts
- clinic is usually different: no pain
- is not a dynamic process
- the pathogenesis is different
ICA dissection “stump flow”

20 days later: IR: 0.78 vs 0.58

FOLLOW UP
dissection is a dynamic process

ICA ats “stump flow”

18 days later: “stump flow”

FOLLOW UP
ats is not a dynamic process
In the case of "stump flow" (US dissection non-specific sign), the presence of:

a) laterocervical sudden pain (or headache) persistent and

b) the absence of carotid ATS disease are very useful for the d.d. between dissection and obstruction of the distal ICA to other causes.
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D) DYSGENESIS OF THE ICA
Atherosclerosis

- usually occurs in the elderly
- it commonly involves the carotid bifurcation and carotid bulb
- usually US signs of atherosclerosis are present in other districts
- clinic is usually different (no pain!)
- is not a dynamic process
- the pathogenesis is different
CAD DISSECTION D.D.
DISSECTED ATS CAROTID PLAQUE

iatrogenic dissected plaque, post TEA

these plaques indicate the possibility of atherosclerosis in an appropriate US/clinical setting. Dissection d.d.:

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- usually US signs of atherosclerosis are present in other districts
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CAD DISSECTION D.D
DISSECTED ATS CAROTID PLAQUE

hyperechoic atherosclerotic plaque, with double-lumen

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CAD DISSECTION D.D
ATS CAROTID IPOECHOIC PLAQUE

ICA dissection

ICA hypoechoic ats plaque

25 days later

33 days later

FOLLOW UP
dissection is a dynamic process

FOLLOW UP
ats is not a dynamic process
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TAKAYASU ARTERITIS
CAD DISSECTION D.D
TAKAYASU ARTERITIS

ICA dissection
vs
Takayasu arteritis

- different clinical and laboratory tests!

US IN TA
- diffuse or circumferential thickening of the vessel wall, which is significantly thicker in active than in inactive lesions
- frequent is CCA involvement with sparing of the ICA/ECA
- typical ‘halo sign’ (concentric hypoechogenic mural thickening representing vessel wall oedema)
Takayasu arteritis

- color Doppler US of the CCA: typical ‘halo sign’ (a concentric hypoechogenic mural thickening representing vessel wall oedema)
Takayasu arteritis

- woman of 39 ys.: CCA occlusion and AV diffuse thickening of the vessel wall
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RADIATION TREATMENT OF THE NECK
Radiation treatment increases the thickness of the common and internal carotid arteries wall during the first year after Rx therapy.

US: parietal thickening of the CCA after radiation therapy of the neck for carcinoma of the hypopharynx.
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D) DYSGENESIS OF THE ICA
extracranial ICA aneurysms are extremely rare
- in the literature, reported incidence is about 0.8-1% of all arterial aneurysms and about 4% of all peripheral arterial aneurysms

Extracranial ICA aneurysms may be classified like:

1. pseudoaneurysms
2. true

1. pseudoaneurysms are mainly secondary to:
   a) previous endoarterectomy
   b) trauma
   c) infections

2. true aneurysms are most commonly due:
   a) to atherosclerosis (the most frequent etiology). May involve various portions of the carotid artery
   b) fibromuscular dysplasia (ICA dysplastic aneurysms, often associated with chronic dissection, are distally located)
   c) dissection aneurysm (traumatic/spontaneous)
CAROTID DISSECTION

- a subadventitial dissection may cause aneurysmal dilatation of the artery
- although such aneurysms often are referred to as “pseudoaneurysms,” they are not, because their walls are composed of blood-vessel elements (i.e., media and adventitia)

ICA atherosclerotic aneurysm
(anechoic circular mass with small calcified plaques)

- usually occurs in the elderly
- usually US signs of atherosclerosis are present in other districts
- clinic is usually different (no pain!)
- is not a dynamic process
pseudoaneurysms secondary to infection

- patient 24 ys, with a mass button at the neck, in the site of injection of heroin
- US: CCA aneurysm
- angioTC: CCA and ACA aneurysm (congenital? for mycotic vasculitis?)
CAD DISSECTION
DIFFERENTIAL DIAGNOSIS

MORFOLOGICAL DIFFERENTIAL DIAGNOSIS

A) "STUMP FLOW"
- cardioembolism
- atherosclerotic steno-obstruction of the distal cervical ICA

B) OTHER CAUSES OF ARTERIAL WALL THICKENING
- atherosclerosis of the carotid bulb and the bifurcation
- vasculitis
- radiation treatment

C) EXTRACRANIAL ICA ANEURYSM

D) DYSGENESIS OF THE ICA
Dysgenesis of the ICA

- dysgenesis of the ICA may be asymptomatic for a long time
- symptoms are due to cerebrovascular insufficiency, compression by enlarged vessels, or associated intracranial aneurysm
- dysgenesis of the ICA may mimic occlusion or long stenosis of the ICA
- the diagnosis is strongly suggested when the carotid canal is absent or hypoplastic
Hypoplasia of the left ICA

1. CT angiography and US: ICA hypoplasia. Asymmetric carotid siphons.
2. TCCD: ACM with low flow
Hypoplasia of the right and left ICA

A. CT angiography and ECD in acute phase: ICA dissection
B. CT angiography and ECD 90 days later: recanalization in hypoplasia of the rt and lt ICA
short videos and playlists on echocolor Doppler study of cervical arterial dissections are available on my youtube channel:
http://www.youtube.com/channel/UCij561sX0bQoEjXIWKuPnKg