Controversies & updates in Vascular Surgery

Paris - january 21 – 23 2016

Venous session

Anatomic Varations of inferior vena cava (IVC):

diagnosis by duplex : is it possible ?

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Disclosure

Speaker name : Lemasle Philippe

I have the following potential conflicts of interest to report:

- ☐ Consulting
- ☐ Employment in industry
- ☐ Shareholder in a healthcare company
- ☐ Owner of a healthcare company
- ☐ Other(s)
- ■ I do not have any potential conflict of interest

Embryogenesis of the IVC

= complex process involving the formation of several anastomoses between three paired embryonic veins

Segmentation IVC

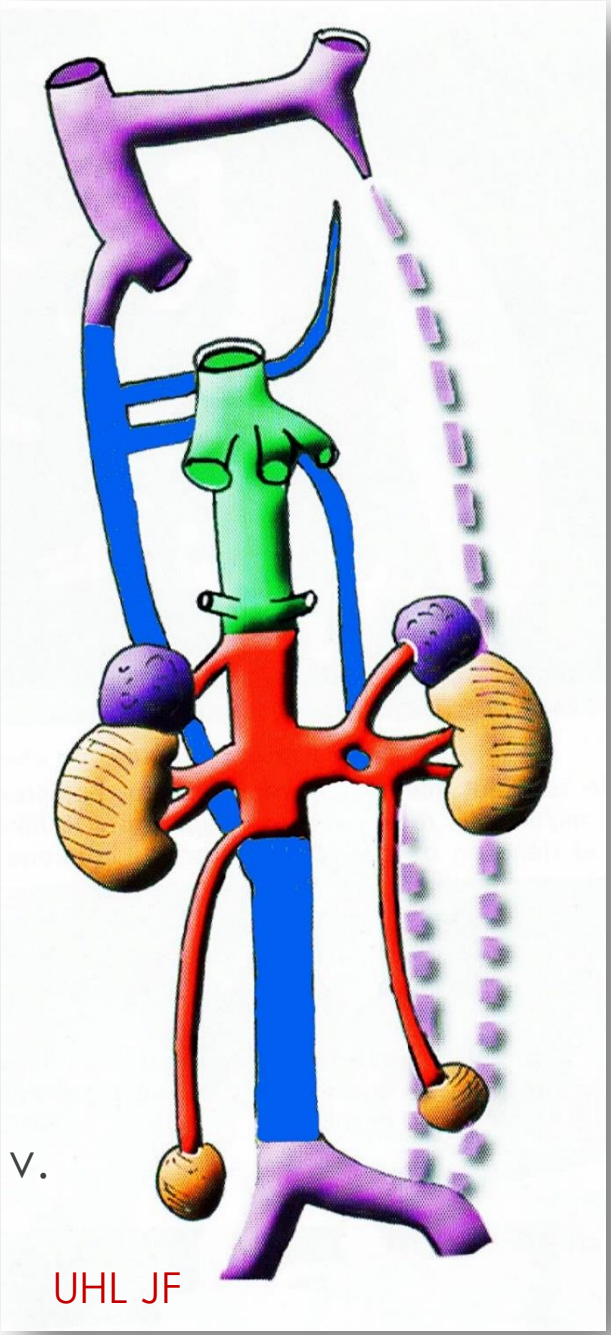
1. **RETROHEPATIC segment**
   = RIGHT VITELLINE v.
   flow rate ≈ 1 500 ml/m

2. **SUPRARENAL segment**
   = RIGHT SUBCARDINAL v.
   flow rate ≈ 1 000 ml/m

3. **RENAL segment**
   = SUBSUPRACARDINAL anastomosis

4. **INFRARENAL segment**
   = caudal extremity
   of the RIGHT SUPRACARDINAL v.

5. **ILIAC venous confluence**
   = caudal extremity of the POSTERIOR CARDINAL v.
   flow rate ≈ 500 ml/m



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Main congenital anomalies of the IVC

- **Variant anatomy of the left renal vein** (LRV)
  - retroaortic LRV
  - circumaortic LRV

- **Anomalies of the IVC**
  - absence of the infrarenal IVC
  - Left IVC
  - IVC duplication
  - absence of the hepatic segment of the IVC with azygos continuation

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- **3rd hypothesis :**
  US positive diagnosis is possible only if several criteria are met :
  - accessibility of the region studied
  - hemodynamic consequences of the lesion
  - the lesion frequency

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  - left IVC
  - double IVC
  - absence of the hepatic segment of the IVC with azygos continuation

Retroaortic LRV

- embryology :

  = abnormal regression of ventral arch (inter SUBcardinal anastomosis)

  + abnormal persistence of dorsal arch of the renal collar

  (complex inter SUPRA et SUB cardinal anastomosis)

- accessible area

- symptomatic lesion = posterior NCS

  = reflux in left ovarian vein (LOV)
  is secondary to compression of the LRV

  ≈ 3 - 4% of symptomatic pelvic varicoses

  - Milka Greiner

- frequency :
  - 1.4 to 3.7% - radiological studies
  - 1.47 to 1.9% - surgical studies

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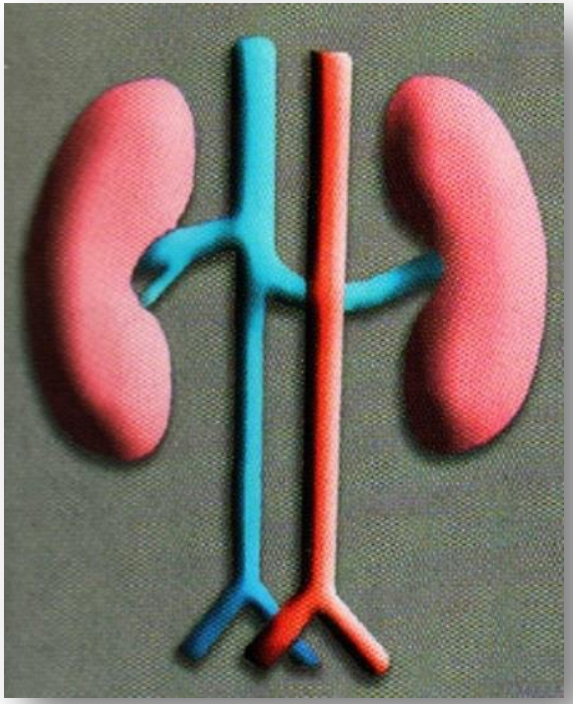

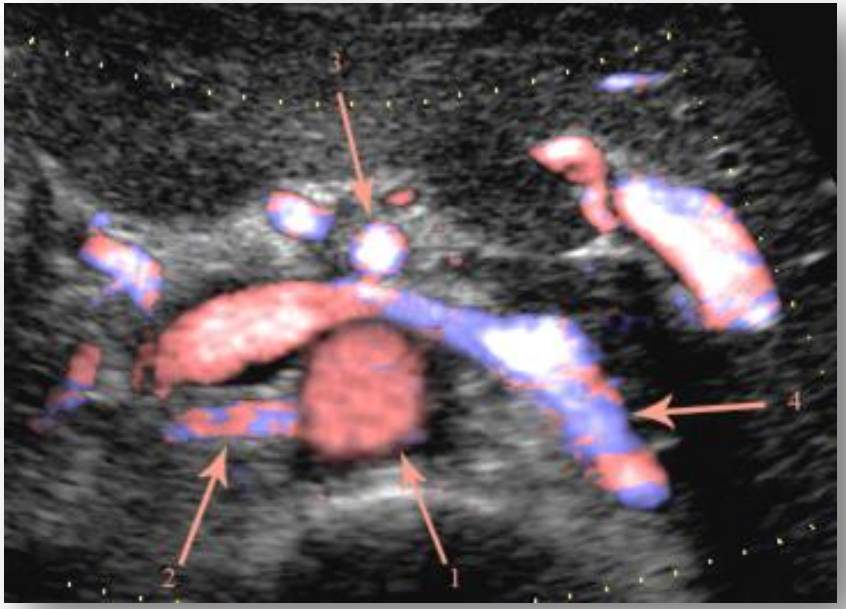
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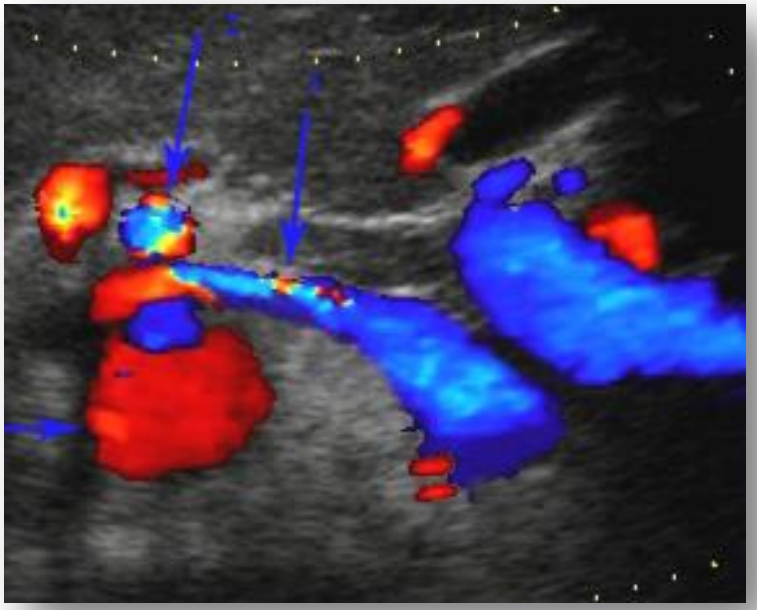

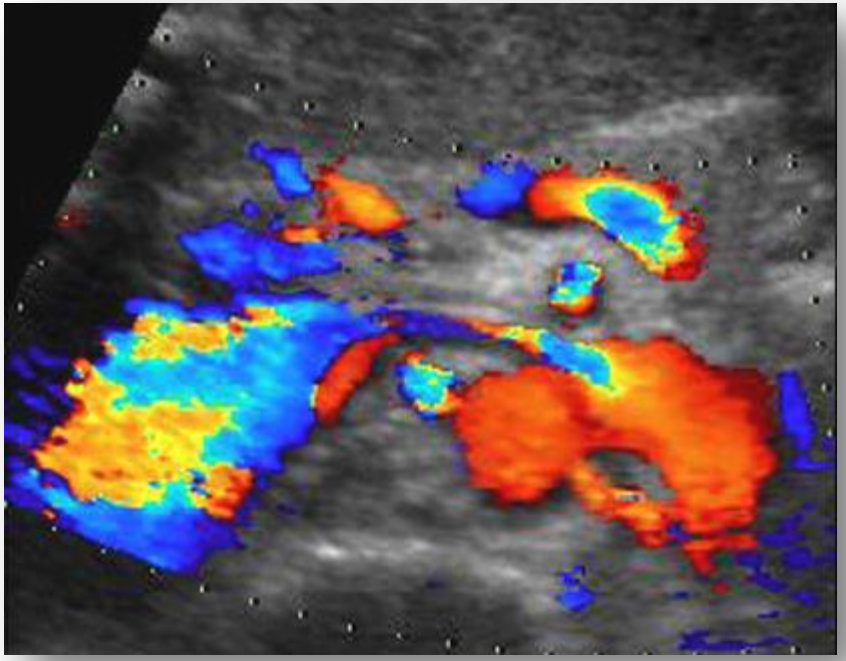

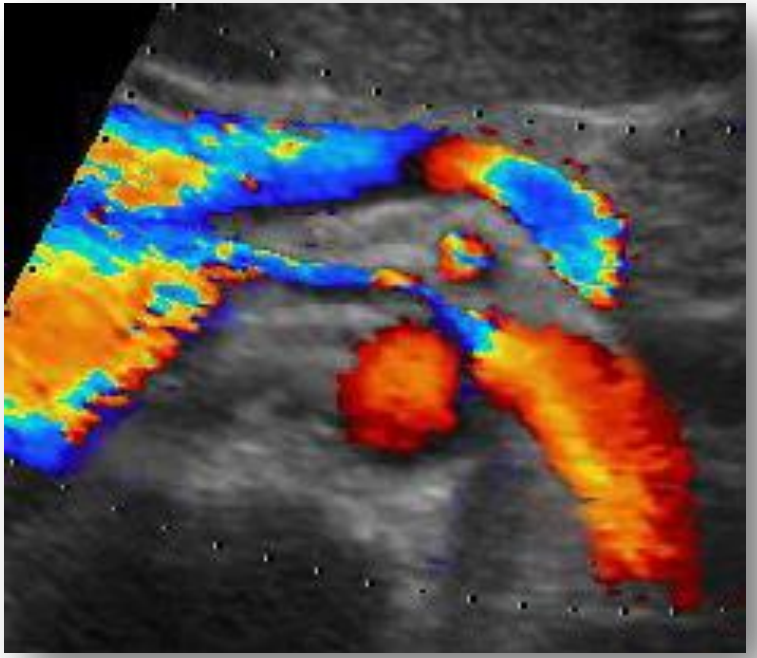

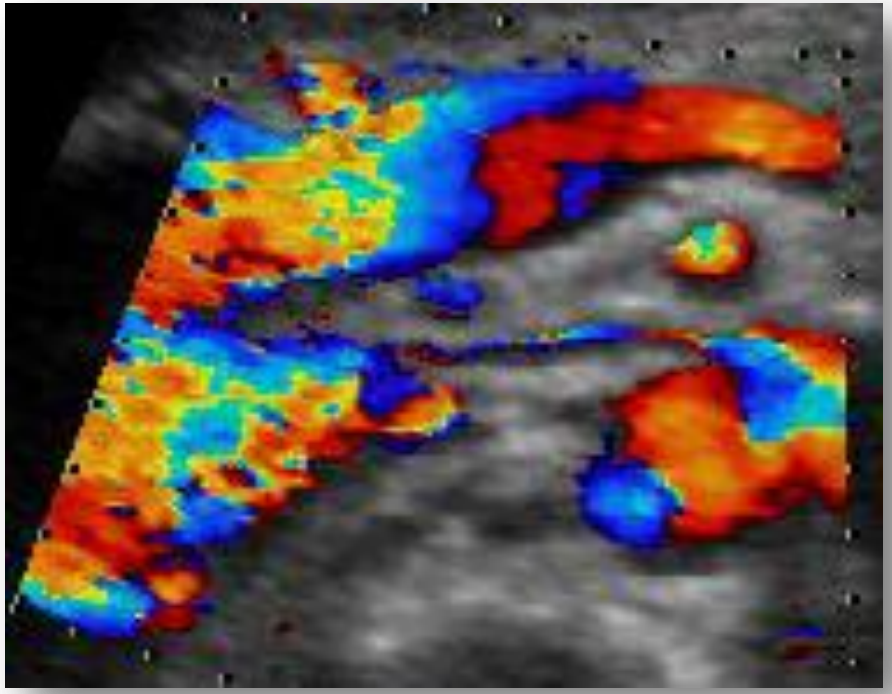

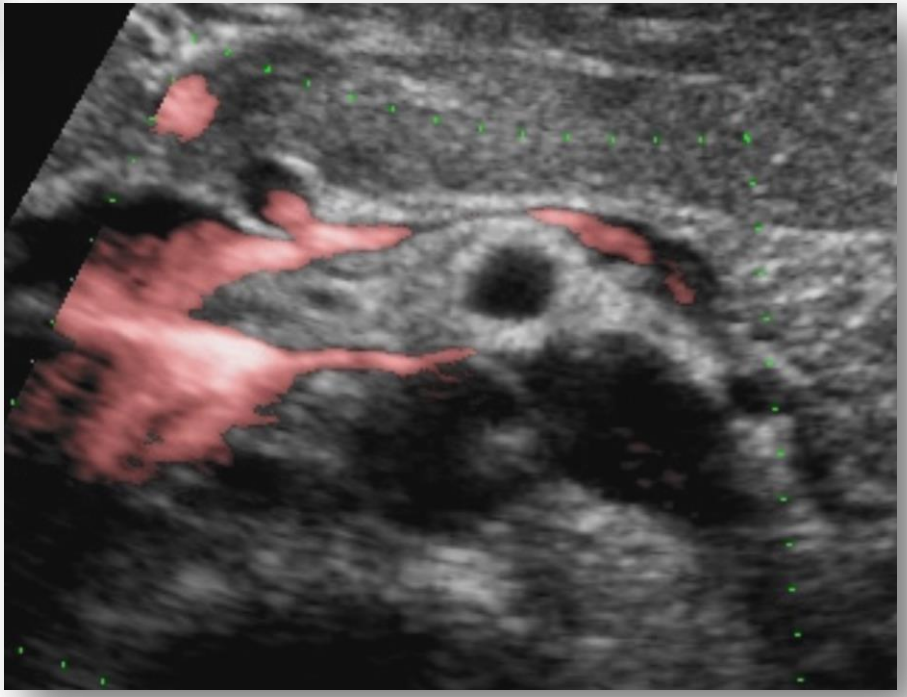

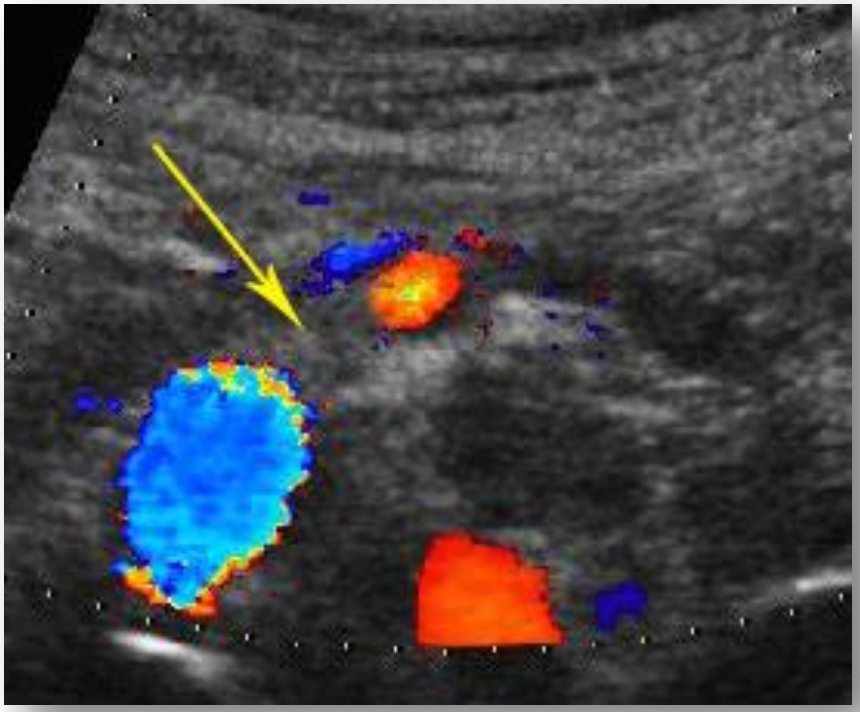

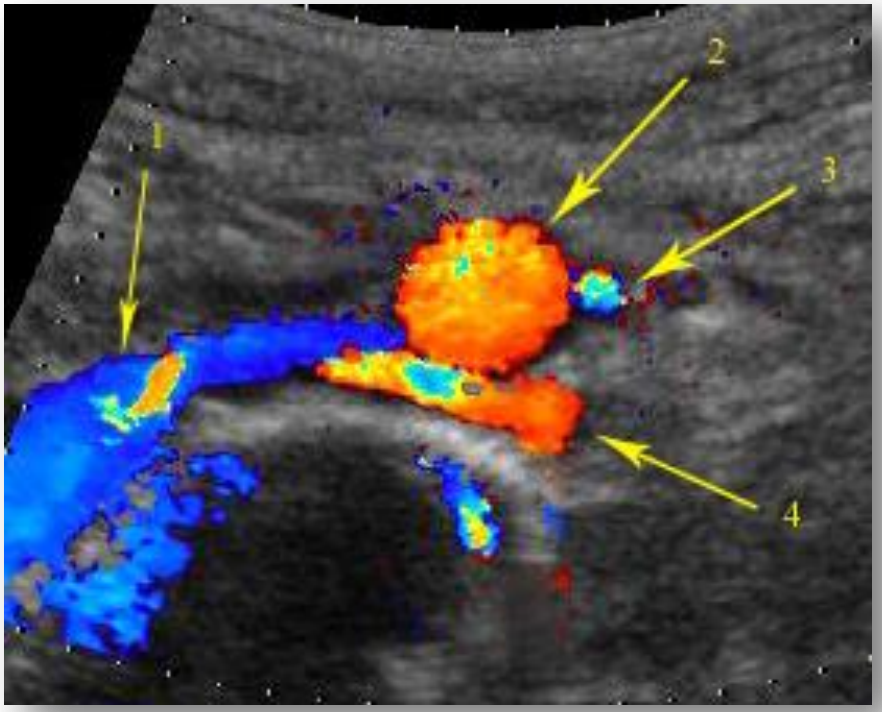
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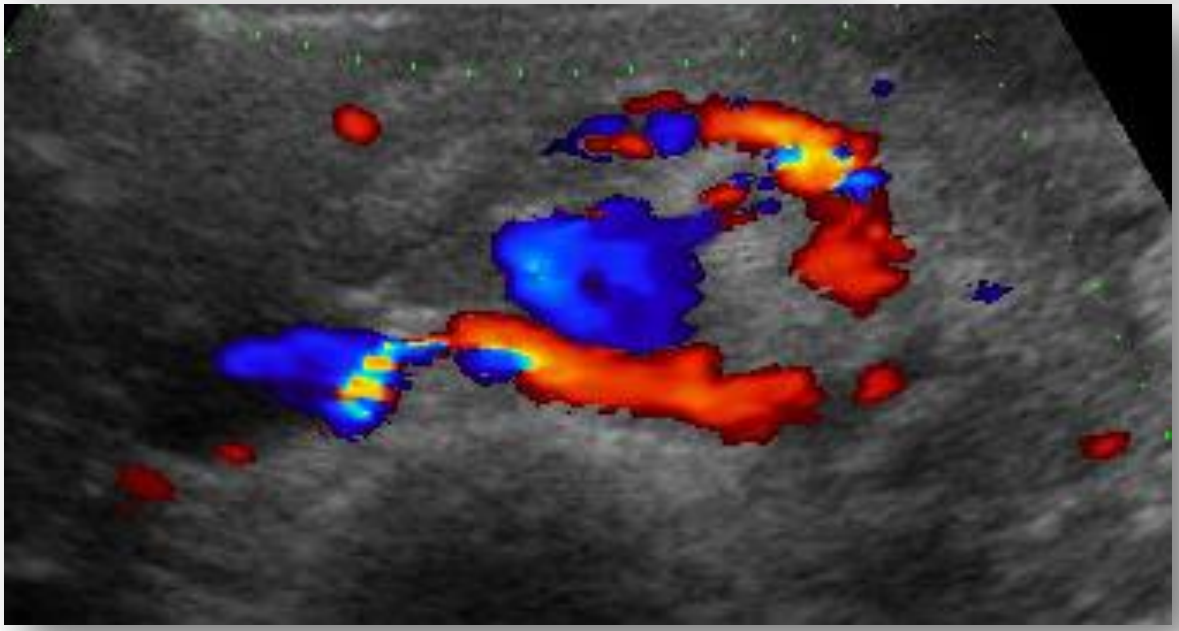

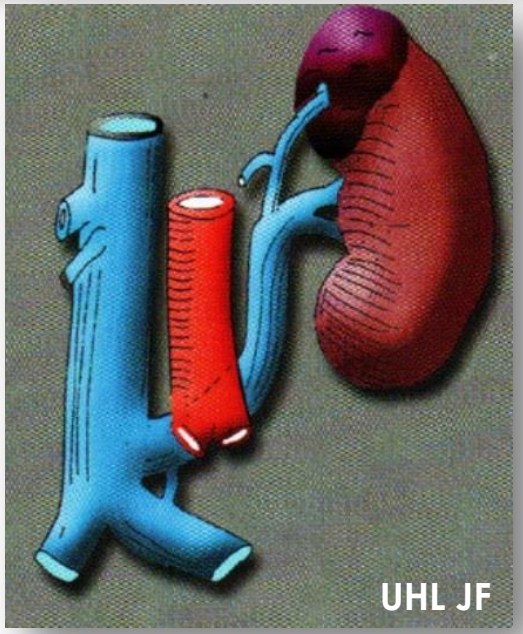
UHL JF

Circumaortic LRV

- embryology
  = abnormal persistence of dorsal arch of the renal collar
  + abnormal persistence of dorsal limb of the embryonic RV

- accessible area

- hemodynamic consequence = NCS
  - LOV generally in the posterior branch
  - specific renal drainage area for each vein

- frequency :
  - 0,9 (CT 2004) to 8,5 % (MR 1996)
  - 0,5 à 0,6 % - surgical studies

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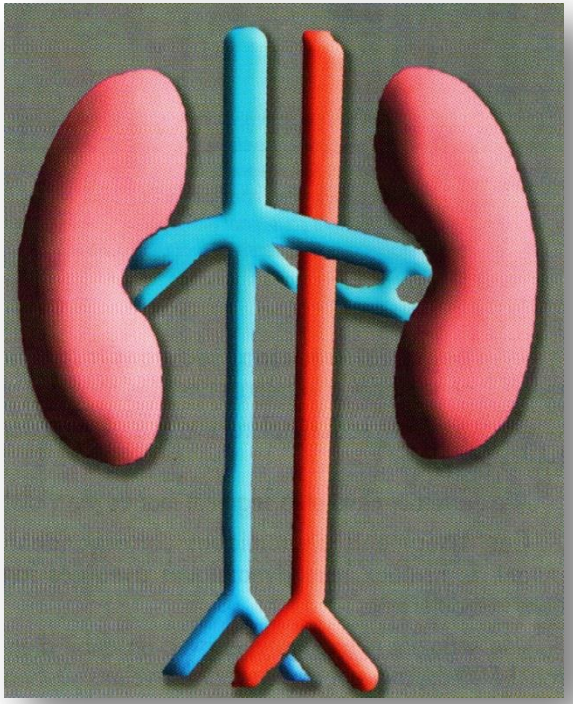


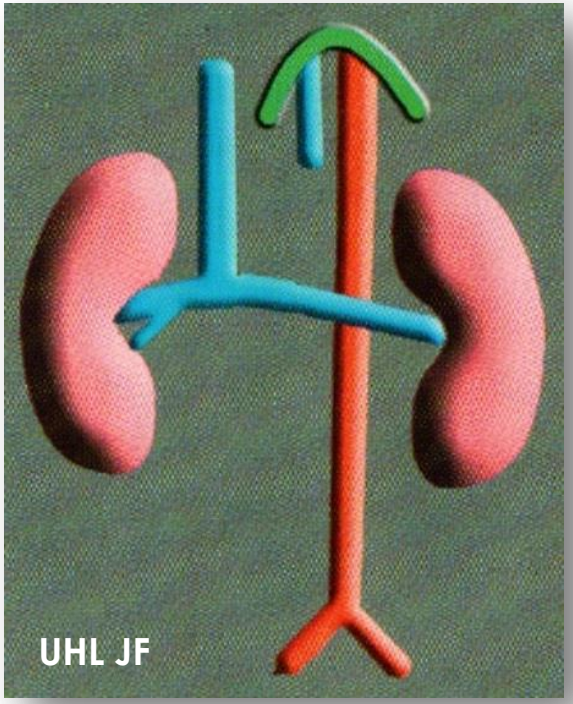
Absence of the infrarenal IVC

- embryology
  = failure of development of the POST-cardinal and SUPRA-cardinal veins

- accessible area

- major hemodynamic consequence
  = lower extremity venous return by the azygos system via ascending lumbar veins & anterior paravertebral collateral vein

- very rare lesion



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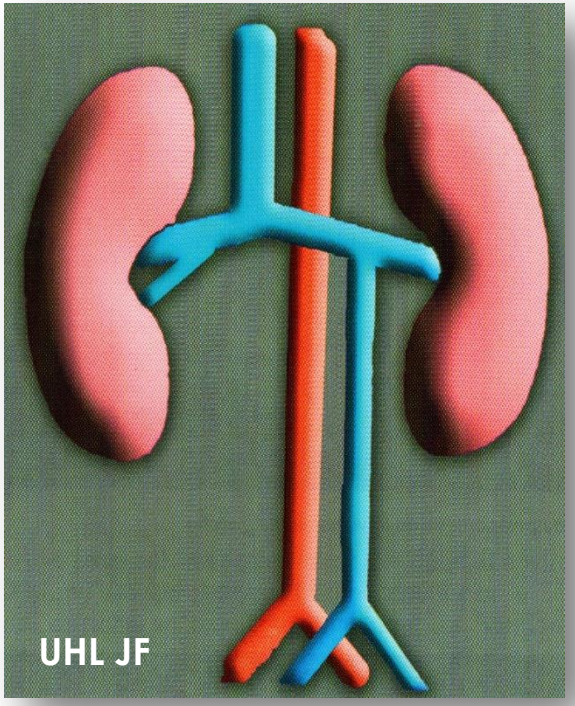
Left IVC

- embryology
  = abnormal regression of the right supracardinal vein
  + abnormal persistence of the left supracardinal vein

- accessible area

- hemodynamic consequence
  = decrease circulatory speed in iliac veins et IVC

- fréquency :
  - 0,35 to 0,6 % - surgical study



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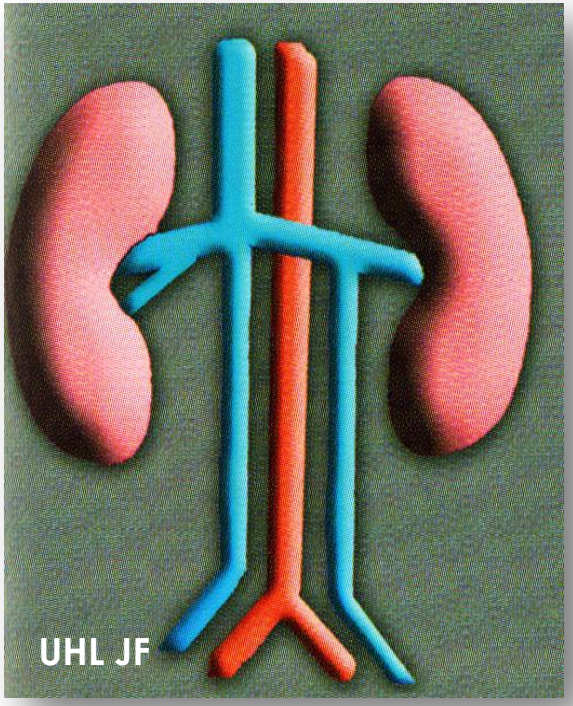
Double IVC

- embryology
  = normal persistence of the right SUPRA-cardinale v.
  + abnormal persistence of the left SUPRA-cardinale v.

- accessible area

- hemodynamic consequence :
  = decrease circulatory speed in iliac veins et IVC

- fréquency :
  - 0,3 % - radiological study (CT 1998)
  - 0,5 to 1,2 % - surgical study



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Azygos continuation of the IVC

- embryology

  = abnormal regression of right VITELLINE v.

  (failure to form the right subcardinal–hepatic anastomosis, with resulting atrophy of the right subcardinal vein)

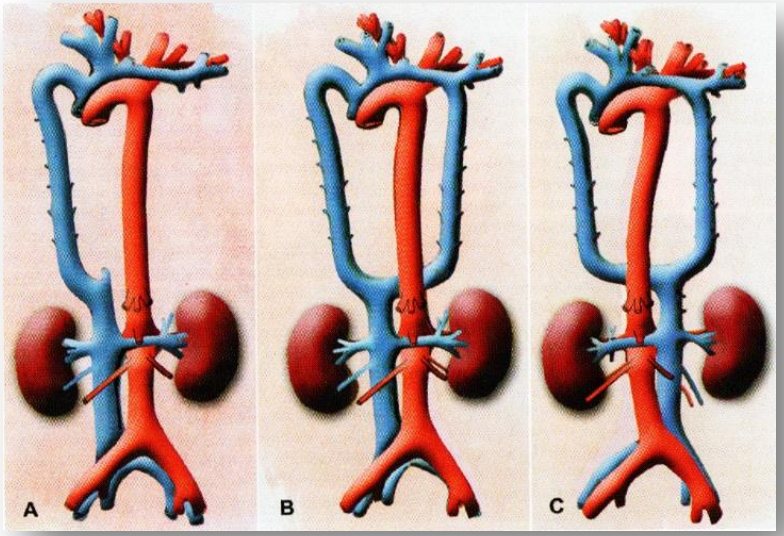
- inaccessible area

- hemodynamic consequence

  = despite the azygos v. expansion >> flow resistance at the azygos arch & SVC

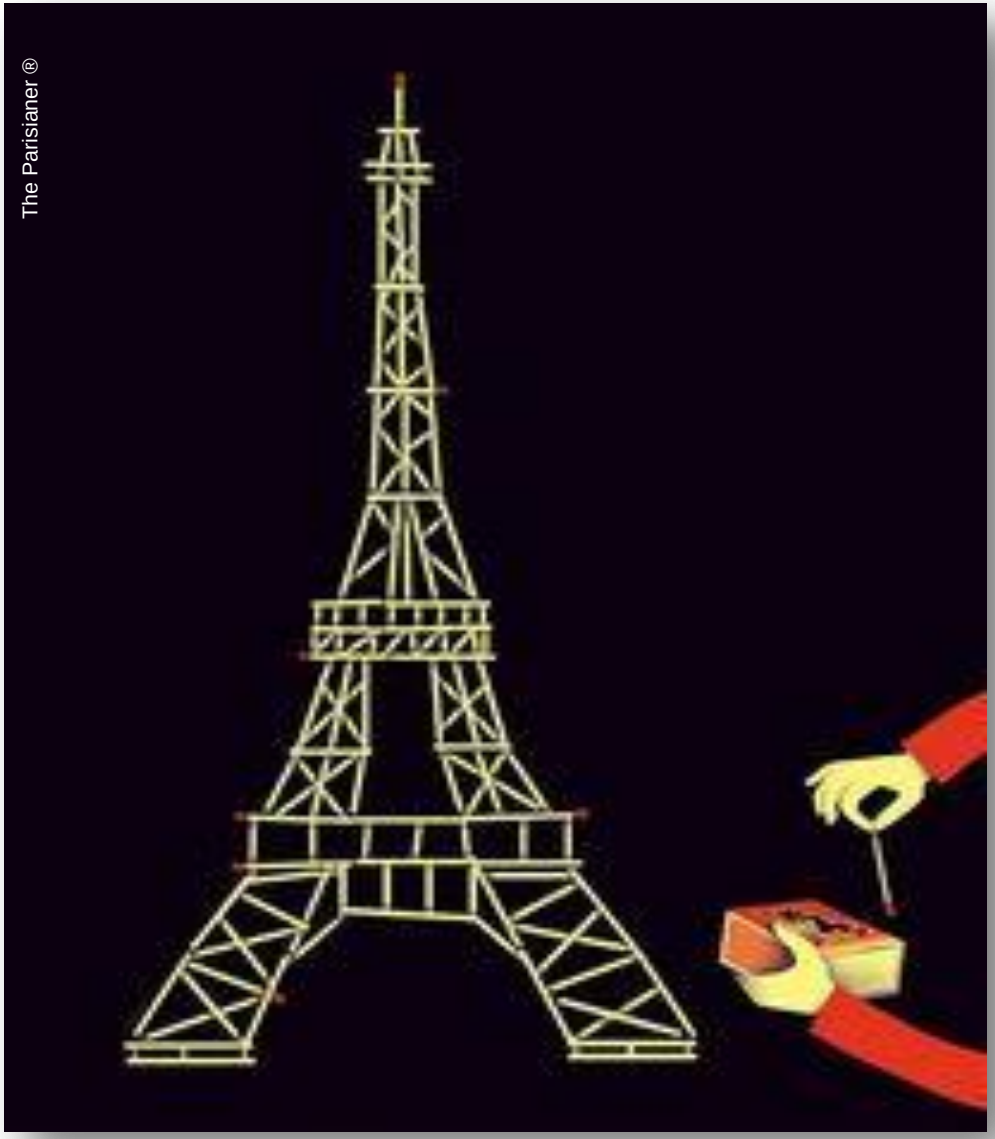
  >> edema in orthostatic

- fréquency :
  - 0,1 % - (CT 1998)



Conclusion

- All these lesions are rare,
  outside abnormalities VRG
- All these lesions are accessible,
  outside the azygos system
- All the anomalies of the IVC have a bilateral hemodynamic consequences, upstream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http://strtn.org/ViewPoster/index.php?idPoster=16&idCong=4

Adult left renal vein

- normal persistence of :
  - the ventral limb of the embryonic renal vein
  - the anterior limb of the renal collar

Main congenital anomalies of the IVC

- **Embryonic development**

  veins evolve according to the flow rate :
  - if flow rate ↘ >> involution of the axis
  - if flow rate ↗ >> development of the axis

- **Anomalie et variation during embryogenesis :**
  - no involution of an axis
  - non development of an axis
  - convergence, anastomose of many axis