



ESPR

European Society of
Paediatric Radiology

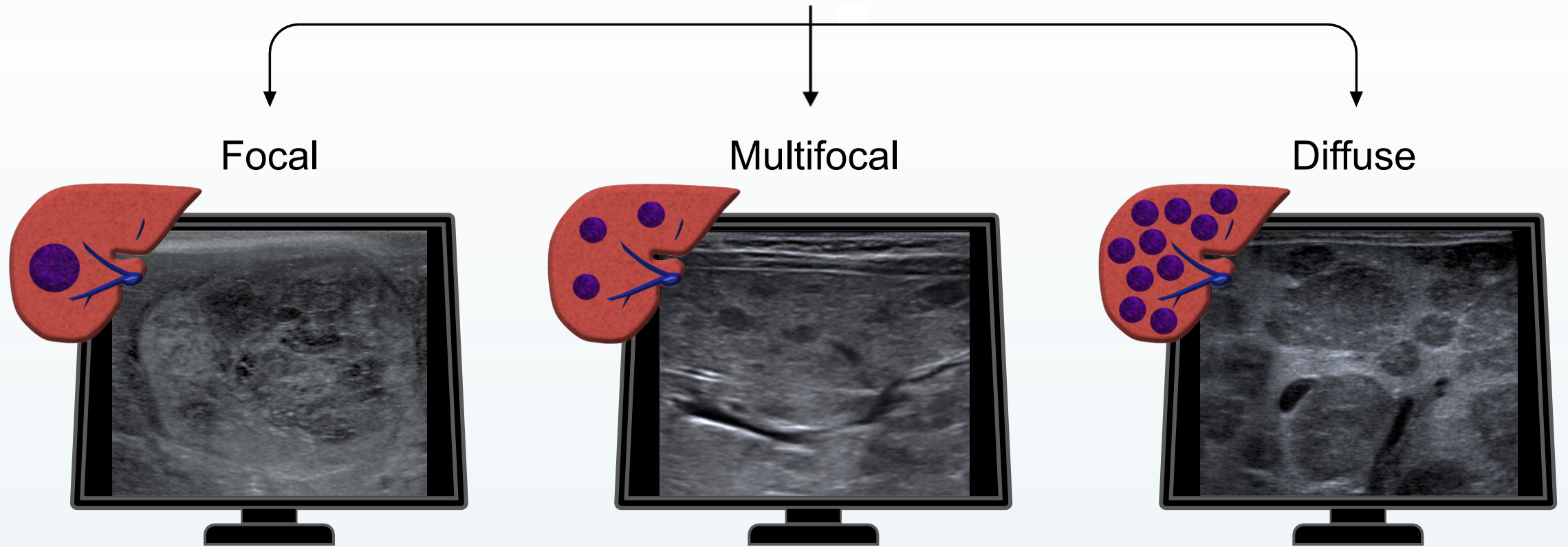
Can ultrasound features predict risk for complications
of pediatric hepatic hemangiomas?
A retrospective cohort study of 112 cases

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HEPATIC HEMANGIOMAS

Most common benign liver tumor of infancy



Adapted from Christison-Lagay et al. 2007

HEPATIC HEMANGIOMAS

Variable manifestations



Asymptomatic



Life-threatening



Heart failure

Liver failure

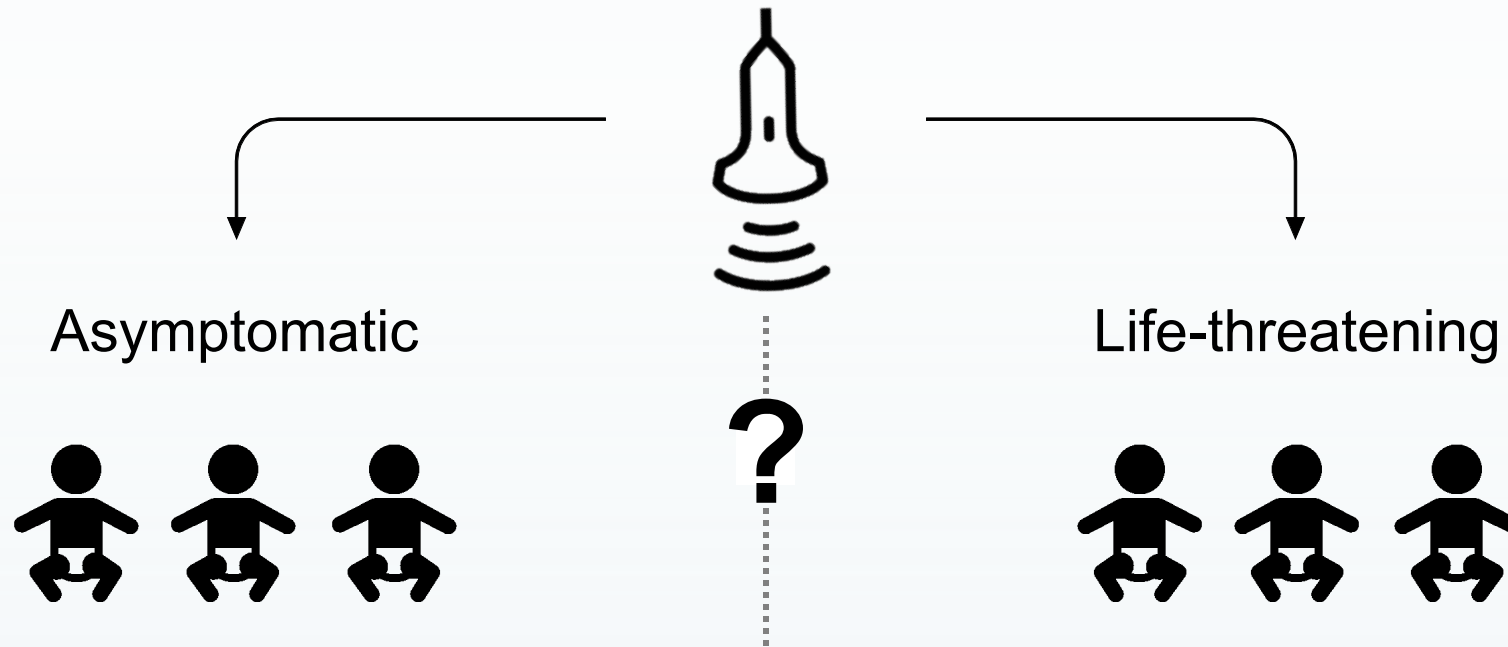
Anemia

Thrombocytopenia

Abdominal compartment syndrome

QUESTION

Variable manifestations



Can initial ultrasound features predict risk of complications?

PATIENTS AND METHODS

Retrospective cohort study 2000-2018

Analysis of initial US features



- Morphological subtype
- Volume (focal forms)
- Echogenicity
- Margins
- Calcifications
- Vascularity
- Hepatic artery systolic speed
- Dilated hepatic veins
- Associated shunts

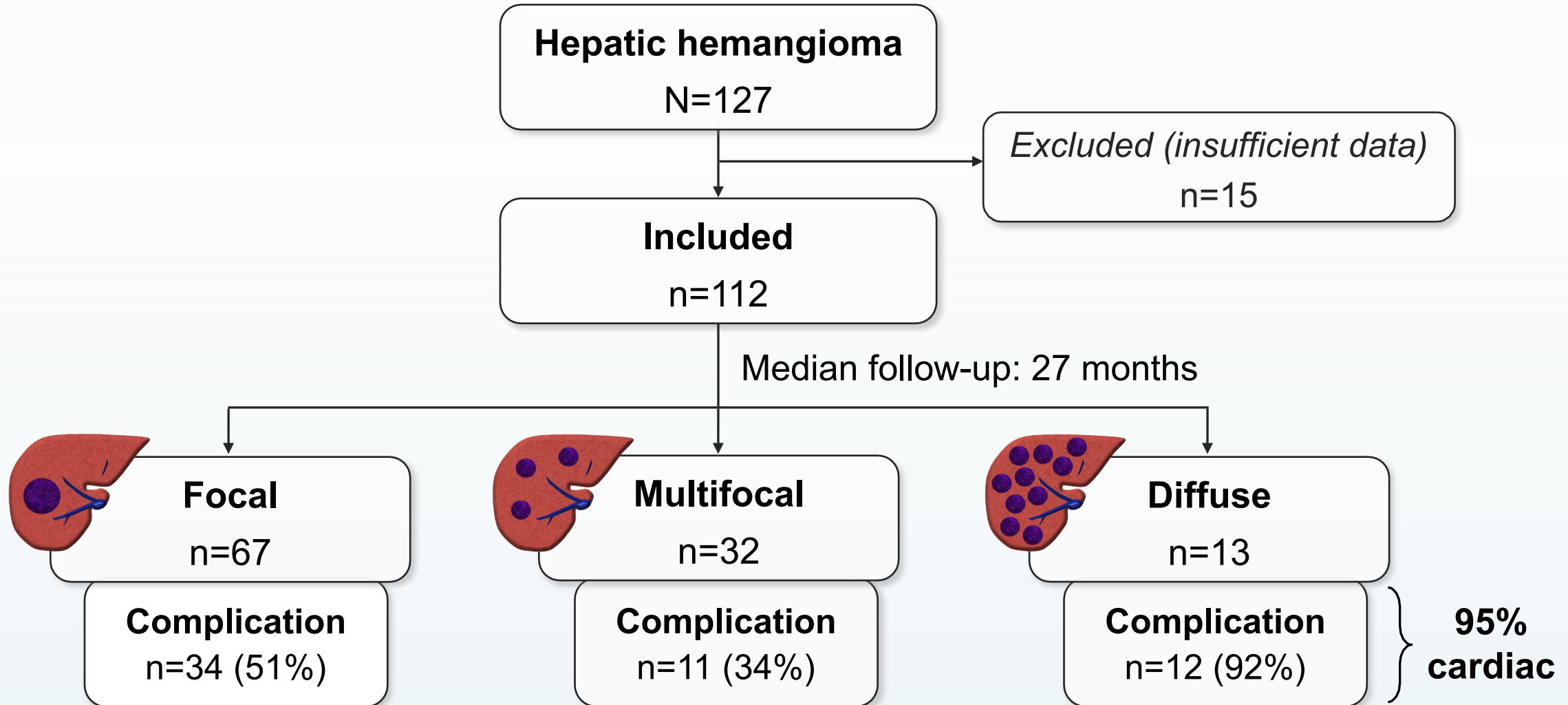
vs

Clinical and lab complications

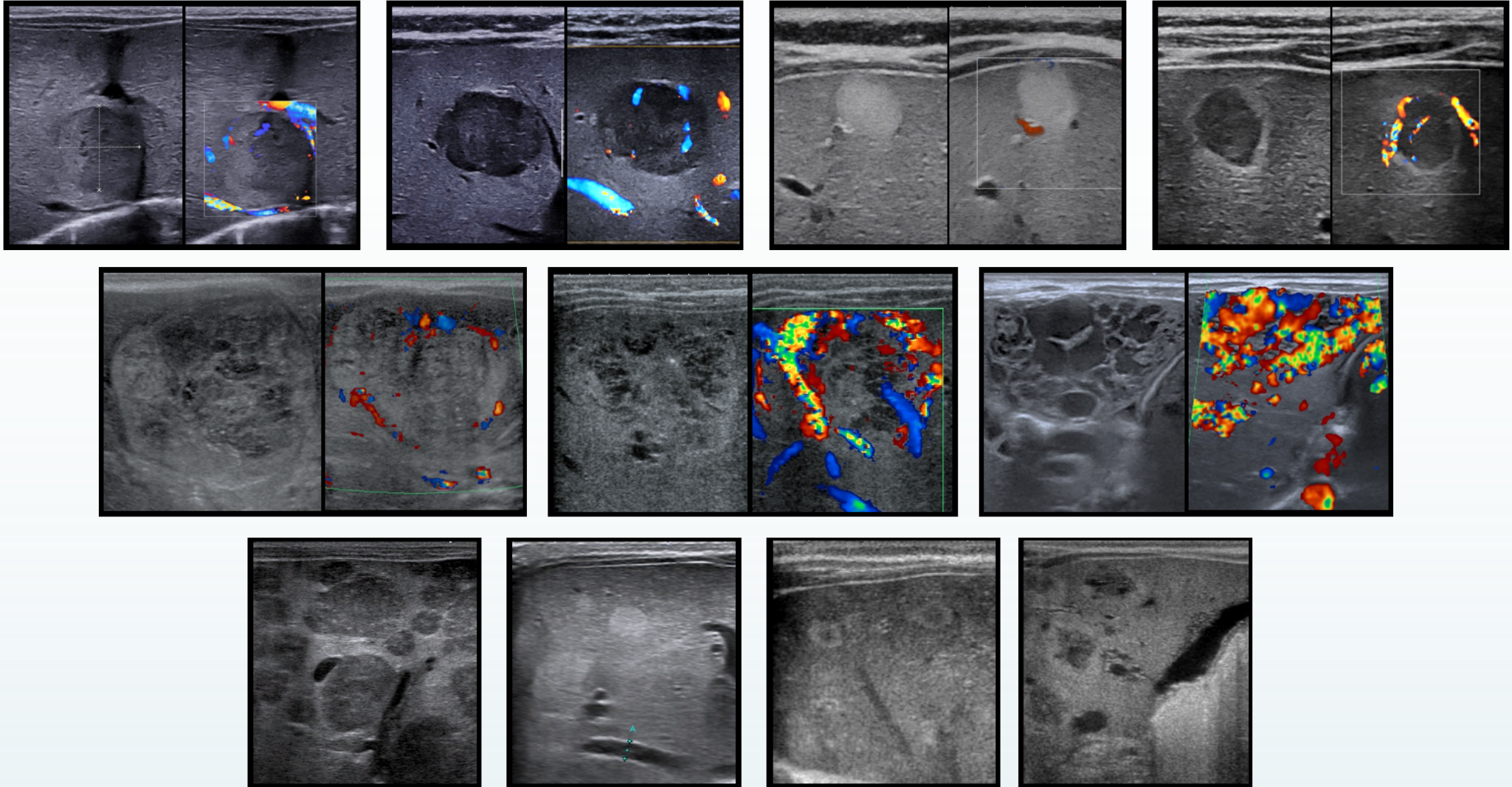
- Compartment syndrome
- Congestive heart failure
- Increased cardiac output
- Pulmonary hypertension
- Liver failure
- Anemia
- Thrombocytopenia
- Consumptive coagulopathy
- Hypothyroidism



FLOW CHART



US FEATURES



LOGISTIC REGRESSION

Variable	Complication (n=57)	No complication (n=55)	Unadjusted OR	Adjusted OR
Diffuse form	12/57 (21%)	1/55 (.02%)	11.7 (1.4-94.7) [.02]	Not included
Tumor volume*	83 (28-195) (n=34)	6 (2-24) (n=33)	1.03 (1.01-1.05) [.001]	
HA peak systolic velocity [†]	143 (105-200) (n=51)	72 (45-92) (n=48)	1.03 (1.02-1.05) [<.001]	1.03 (1.01-1.04) [<.001]
Margins, well-defined	26/57 (46%)	27/56 (48%)	1.2 (0.5-2.4) [.71]	
Echogenicity, hyperechoic	23/57 (40%)	19/55 (35%)	1.3 (0.6-2.8) [.53]	
Calcifications	17/57 (30%)	10/55 (18%)	1.9 (0.8-4.7) [.15]	
Dilated hepatic vein(s) ^{††}	43/55 (78%)	12/45 (27%)	12.5 (5.1-31.0) [<.001]	4.1 (1.2-13.9) [.03]
Vascularity, marked	17/53 (32%)	5/52 (10%)	4.4 (1.5-13.2) [.01]	1.9 (0.5-7.6) [.38]
Macroscopic portohepatic shunt	18/57 (32%)	9/54 (17%)	2.3 (0.9-5.7) [.07]	1.2 (0.3-4.2) [.83]

Legend: *Tumor volume (ml) for focal forms only; [†]Hepatic artery peak systolic velocity (cm/s); ^{††}Dilation of one or more hepatic veins

LOGISTIC REGRESSION

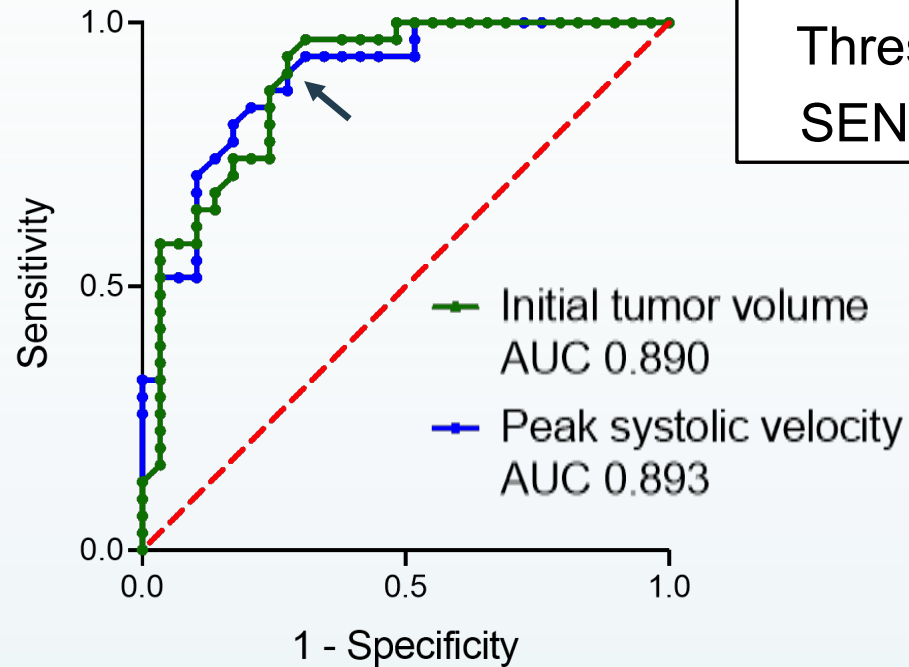
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ROC ANALYSIS

Focal forms

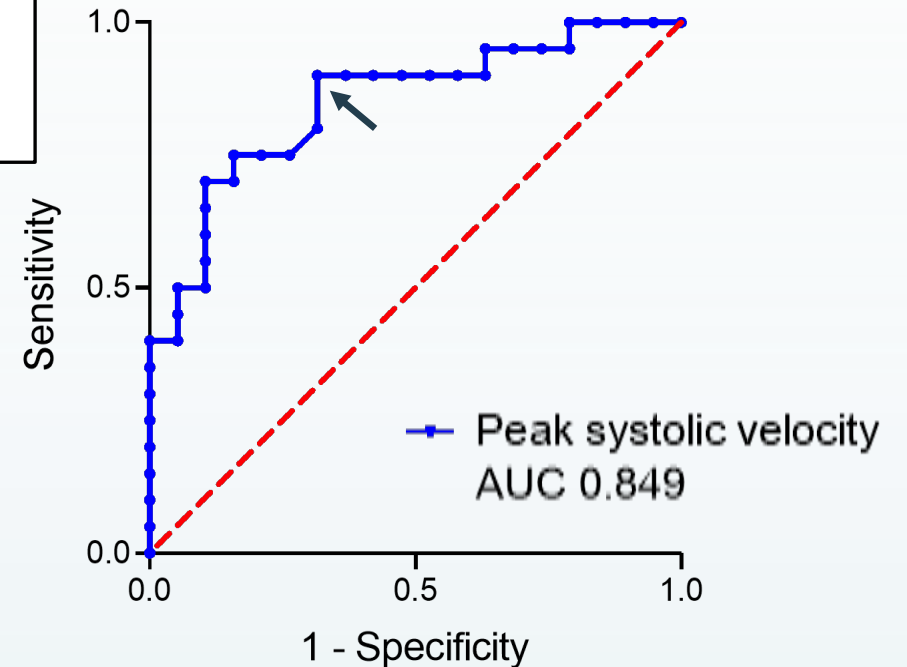
Volume > 40 ml
Velocity > 1.00 m/s



Threshold values
SEN/SPE > 70%

Multifocal and diffuse forms

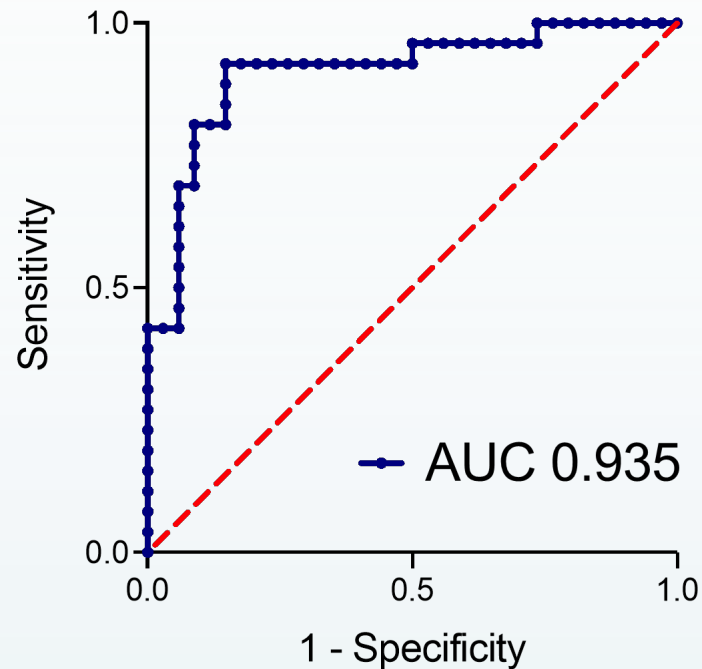
Velocity > 1.15 m/s



PREDICTIVE MODELS OF COMPLICATIONS

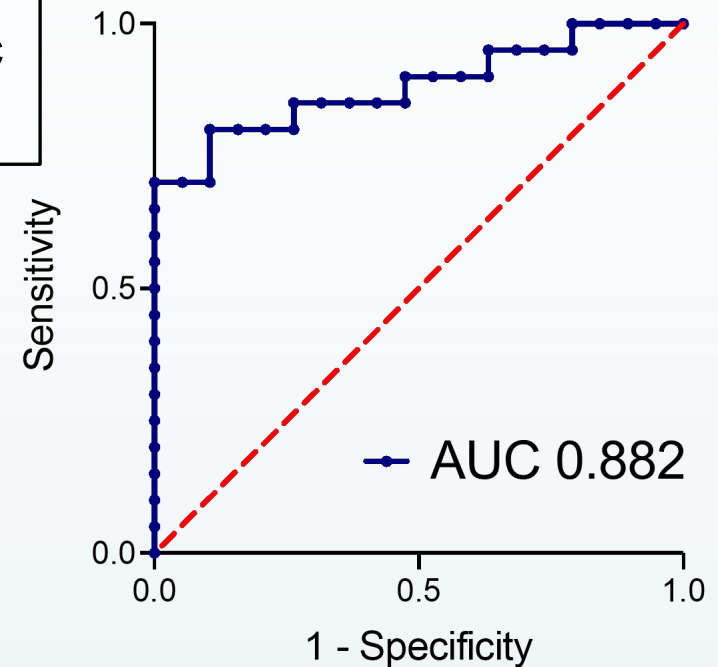
Focal forms

$$\text{Probability}(\text{complication}) = \frac{1}{1 + e^{4.06 - 0.03 \cdot \text{Velocity} + 0.02 \cdot \text{Volume} - 1.52 \cdot \text{Dilated Vein}}}$$



Multifocal and diffuse forms

$$\text{Probability}(\text{complication}) = \frac{1}{1 + e^{3.61 - 0.03 \cdot \text{Velocity} - 1.53 \cdot \text{Dilated Vein}}}$$



Multivariate logistic regression models

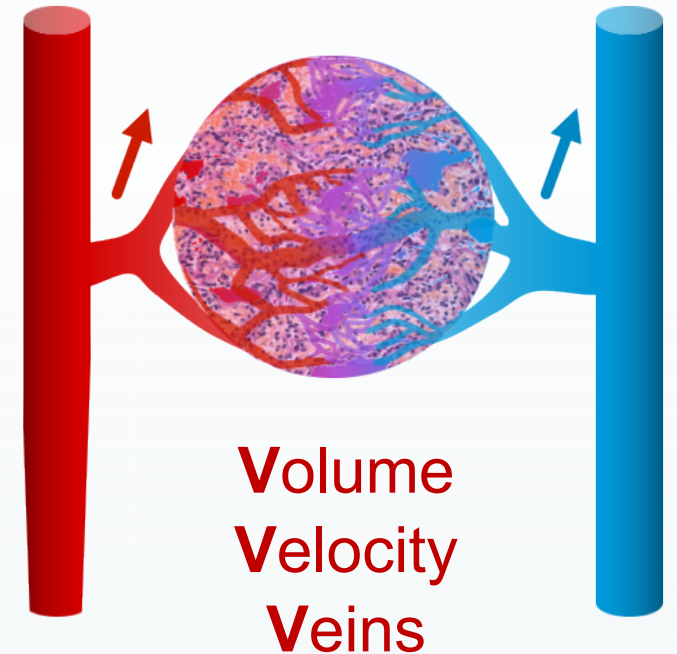
LIMITATIONS

- Retrospective study
 - Single center
 - Long time frame
 - Missing data
- Lack of external validation for prediction models

KEY POINTS

Risk factors for complications:

- Diffuse subtype
- Large tumor volume (focal forms)
- Elevated peak systolic hepatic arterial velocity
- Dilation of one or more hepatic vein(s)



➤ ***Simple objective parameters that could justify closer patient follow-up***

FURTHER PERSPECTIVES

Multicentric registry study to validate risk prediction models

Hemangioma subtype	Focal form	∨
Tumor volume	10-20 ml	∨
Hepatic artery peak systolic velocity	50-60 cm/s	∨
Dilated hepatic vein(s)	No	∨
Calculate		

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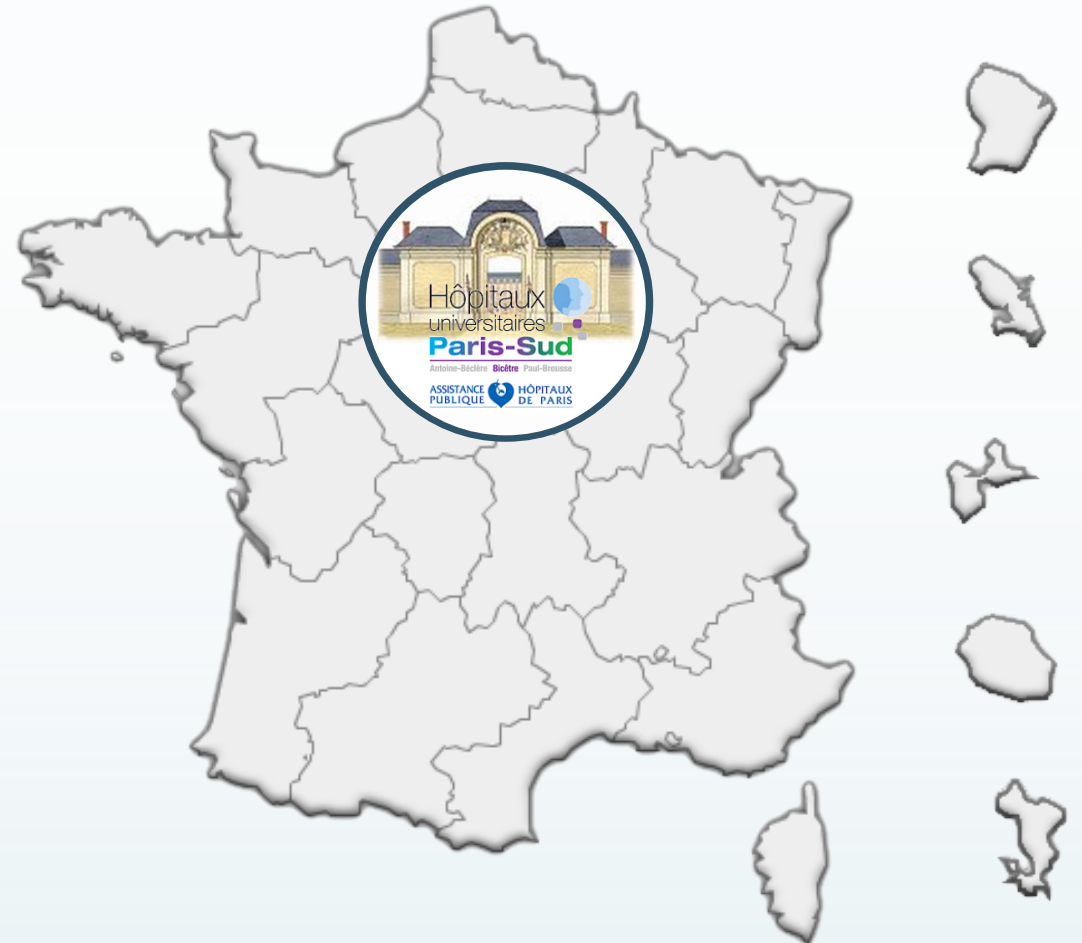
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THANK YOU FOR YOUR ATTENTION



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