

IMPROVING BUBBLE TTE

Better injection, imaging, and respiratory strain techniques

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DISCLOSURE

 NOTHING TO DISCLOSE



THE TROUBLE WITH BUBBLES

■ The diagnosis of right-to-left shunt has become important due to:

1) Emerging evidence of the clear association between septal defects and stroke, brain abscess, hypoxia.

2) New, low risk treatment options for septal closure

■ Trouble is: “Bubbles” are a surrogate for anatomy and flow; i.e. an indirect, non-specific measure of a variable disorder. We rely on bubbles but bubbles are not the same as anatomy or structure.



AGITATED BUBBLE CONTRAST ECHOCARDIOGRAPHY

- The use of “bubbles” was first proposed in 1976 to help define right heart structures due to imaging limitations.
- Newer contrast agents which traverse the lung now help define structures.
- Agitated bubble contrast studies remain the standard for defining right-to-left shunt and replace other agents (CO₂, green dye, Renograffin, oxypolygelatine, dextrose)



SAFETY OF TTE BUBBLE CONTRAST

AMERICAN SOCIETY OF ECHOCARDIOGRAPHY 1984**

27,000 Contrast Echos

Complications

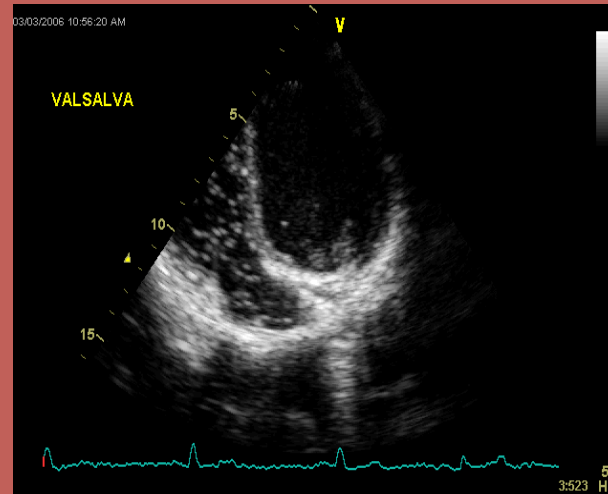
- Hemi-sensory TIA
- Hemi-paresis TIA
- Aura, Headache w/ aura
- Aphasia, Vertigo TIA
- Dizziness, Confusion

MOST IN PTS WITH RLSHUNT

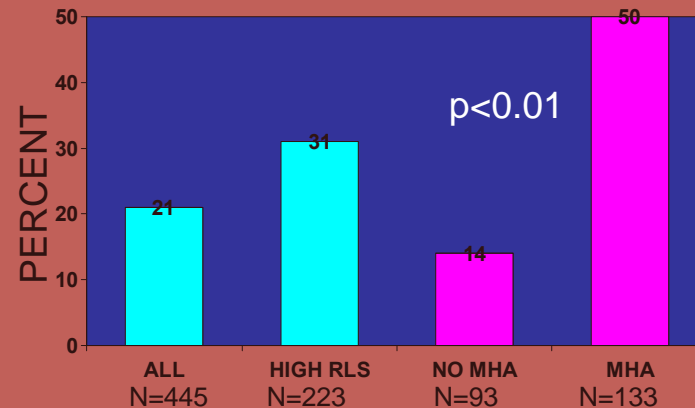
TCD BUBBLES CAUSE MIGRAINE SX (migraine headache, aura, vertigo or visual loss) IN PTS WITH SEVERE RLS

Proves mechanism of RLS and neurological events

**Bommer WJ JACC 1984; 3:6-13



CAN ALL THOSE BUBBLES BE SAFE?



TCD INDUCED MIGRAINE SX

Sorensen SG et al AJC 2005; 96:91

IMPROVING TTE BUBBLE CONTRAST STUDIES

Non- imaging technical issues



Injection Methods

Bacterio-Static NS

*Air, BLOOD, BSNS

10+ agitations

Ante-cubital IV

VALSALVA

CALIBRATED RESPIRATORY STRAIN

*18 agitations=1.9 X more bubbles

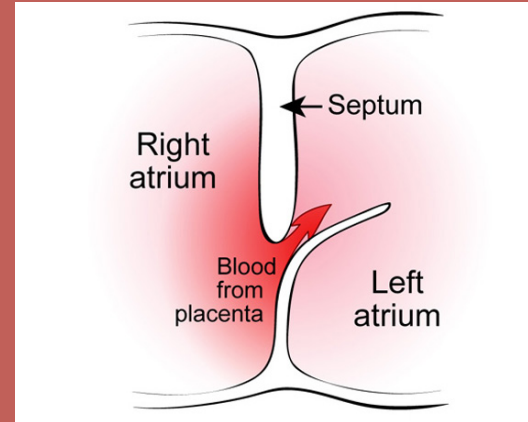
* Blood= 3.8 X more bubbles (= size)

Source: Cerebrovasc Dis 2007; 23:424

IMPROVING TTE BUBBLE CONTRAST STUDIES

Imaging techniques and pitfalls

■ Shunt studies
ASSUME that bubbles reach the heart and the septum.



■ Studies where bubbles fail to OPACIFY the right heart are non-diagnostic and should not be reported as “negative”.



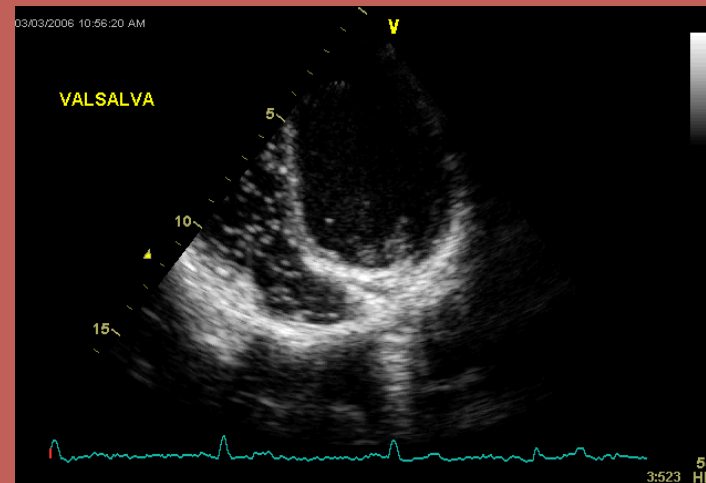
GOOD OPACIFICATION



IMPROVING TTE BUBBLE CONTRAST STUDIES

Imaging techniques and pitfalls

- Valsalva and calibrated respiratory strain are critical and can be assessed by septal displacement.
- Septal aneurysms indicate increased stroke risk and are best seen with bubble contrast against the septum
- Rest shunting is a major predictor of stroke risk (indicates continuous duration of shunt). Rest shunt is probably more important than Valsalva shunt and needs to be noted



SEPTAL ANEURYSM

- seen on echo
- seen with contrast
- seen as right displace

IMPROVING TTE BUBBLE CONTRAST STUDIES

Imaging technique and pitfalls

- TTE provides important information regarding pathology which may result in embolic stroke; i.e. valves, chambers, thrombus.
- Normal structures and physiology may alter shunt studies:
 - Eustacian valve
 - Prominent IVC inflow (“IVC wash”)
- Abnormal conditions may reduce shunt due to increased left heart pressures:
 - Mitral stenosis, Mitral regurgitation
 - Left heart failure of any cause
- Abnormal conditions of the right heart may alter shunting and increase risk:
 - Sleep apnea
 - Pulmonary hypertension
 - Tricuspid regurgitation

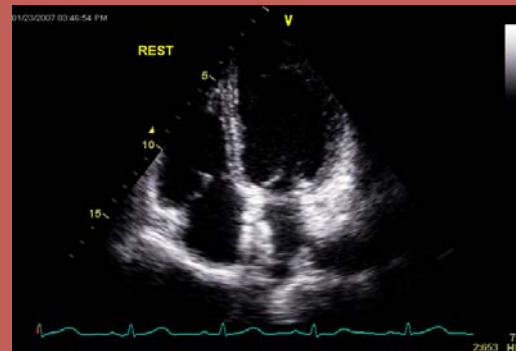


BUBBLES ≠ ANATOMY

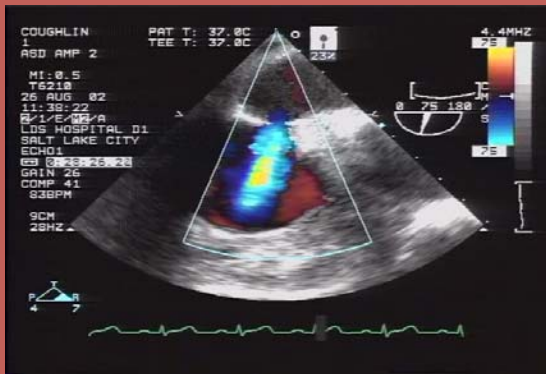
Stop reporting bubbles as “small PFO” !



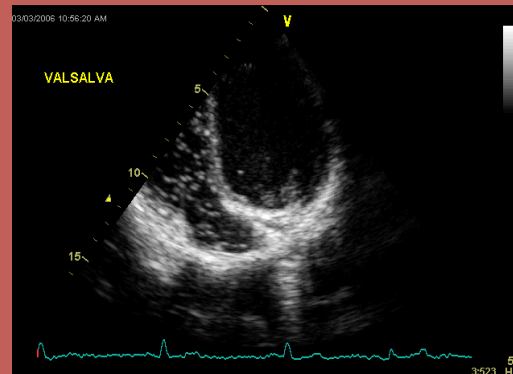
**NORMAL VARIANT
PULMONARY CONDUCTANCE**



**PULMONARY AVM IN
A SEPTAL CLOSURE PT**



SECUNDUM ASD/ALL HAVE RLS



PATENT FORAMEN OVALE

Stroke, brain abscess, TIA, decompression illness, hypoxemia;
i.e. all shunt mediated syndromes are not anatomy specific

CONCLUSIONS

- TTE combined with “bubble contrast” is an invaluable tool in defining stroke risk.
- The serious nature of disabling stroke and the new treatment options for stroke prevention mean that Contrast TTE must be performed at the highest level.
- Best contrast TTE studies are easily achievable through attention to procedural, imaging, and interpretation issues.
- Best quality bubble contrast TTE studies will aid in the early diagnosis and prevention of stroke and will reduce unneeded testing and anxiety in patients without significant risk

