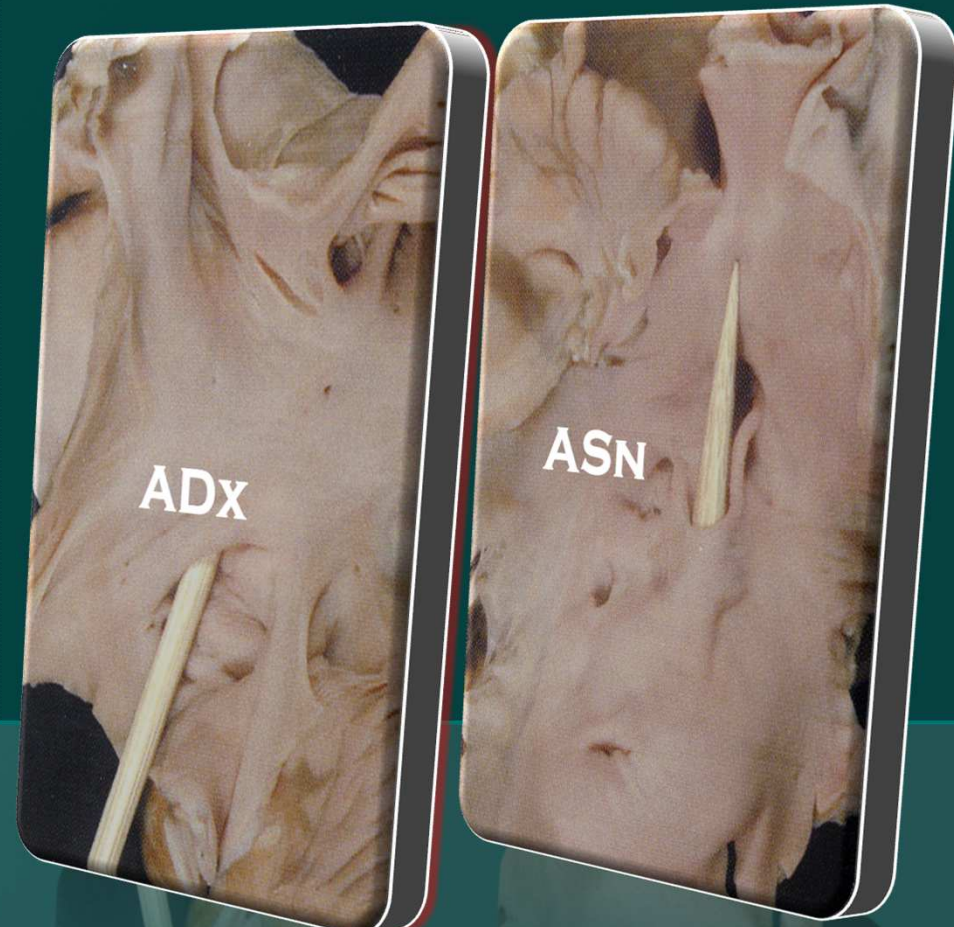


What is the Patent Foramen Ovale?

Parma 15 Marzo 2016

PFO is a
“TUNNEL”



M.A. Cattabiani MD, PhD

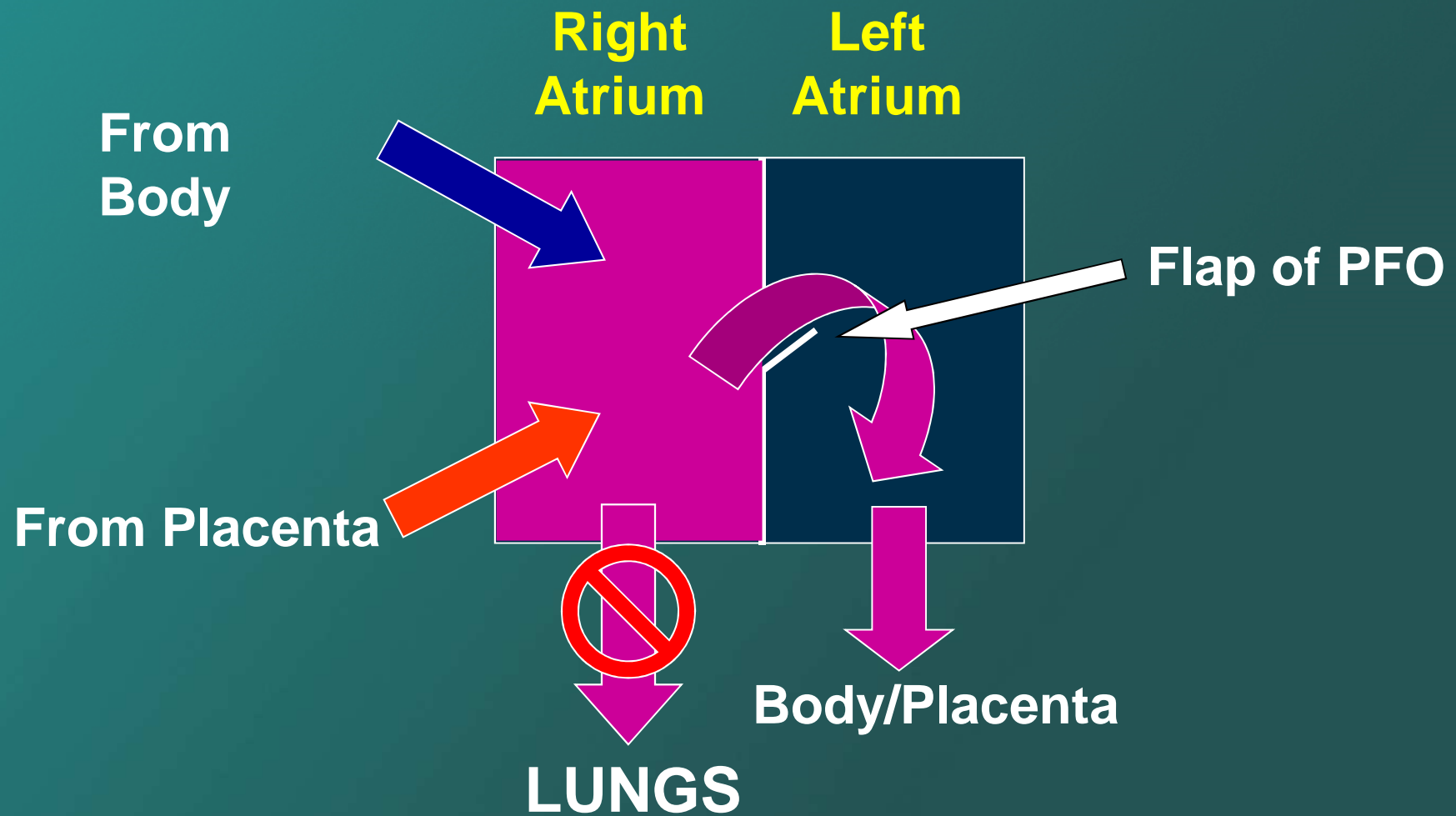


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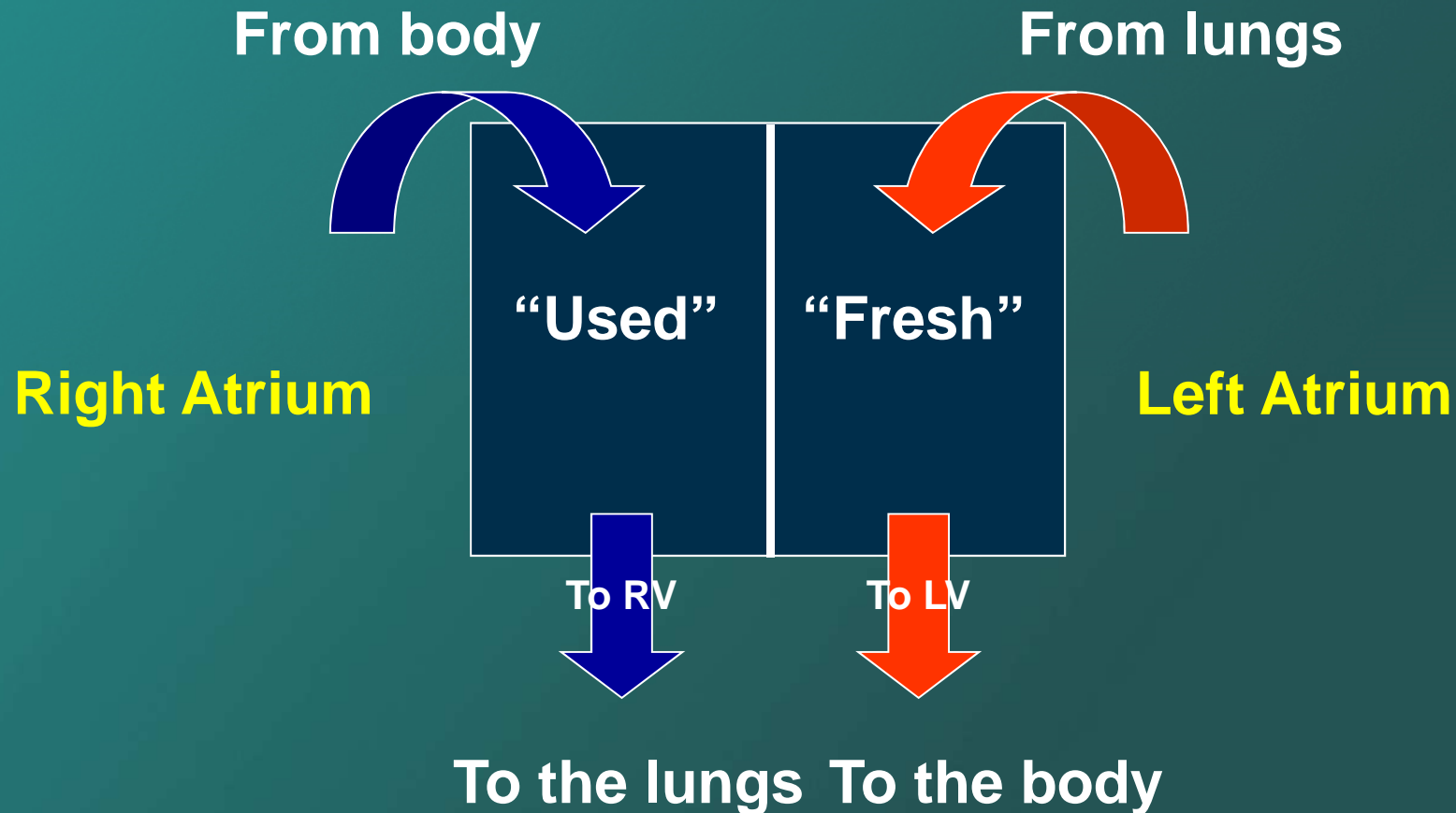
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Normal Fetal Circulation



Normal Post-Natal Circulation



Prevalence of PFO

- PFO in the “Normal” Population
 - 20-30% “Probe” Patency at Surgery/Autopsy:
 - Hagen et al. Mayo Clin Proc (1984)
 - Others dating back nearly 200 years
 - 10 – 15% “Functional” Patency by TEE:
 - Lechat et al – *NEJM* (1988)
 - Webster et al – *Lancet* (1988)
 - Many others subsequently



Clinical Syndromes a/w PFO

- **Stroke, TIA, and Systemic Embolization**
- **Migraine**
- **Decompression Illness**
- **Cyanosis**

PFO and Paradoxical Embolization

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Columbia University Medical Center*



Clinical Syndromes

PFO and Stroke/TIA

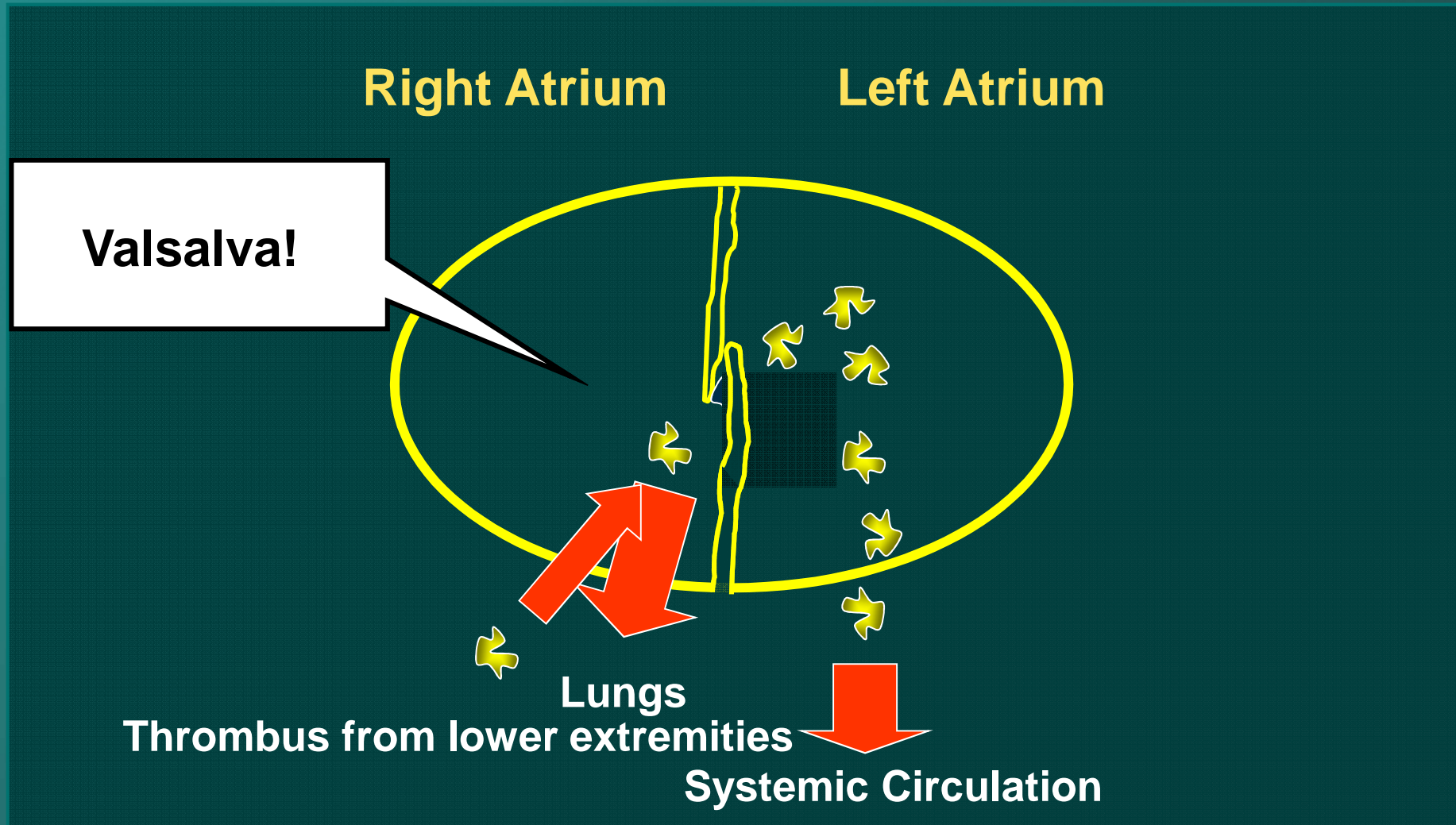
- In stroke pts < 55 yrs old, no other source, prevalence of PFO is 41-60%:
 - Webster et al. *Lancet* (1988) 2(8601):11.
 - Lechat et al. *NEJM* (1988) 318:1148.
 - Ranoux et al. *Stroke* (1993) 1:31.
 - Bogousslavsky et al. *Neurology* (1996) 46:1301.

Mechanisms of Paradoxical Embolization

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Proposed Mechanism of Paradoxical Embolization 1



Clinical Syndromes

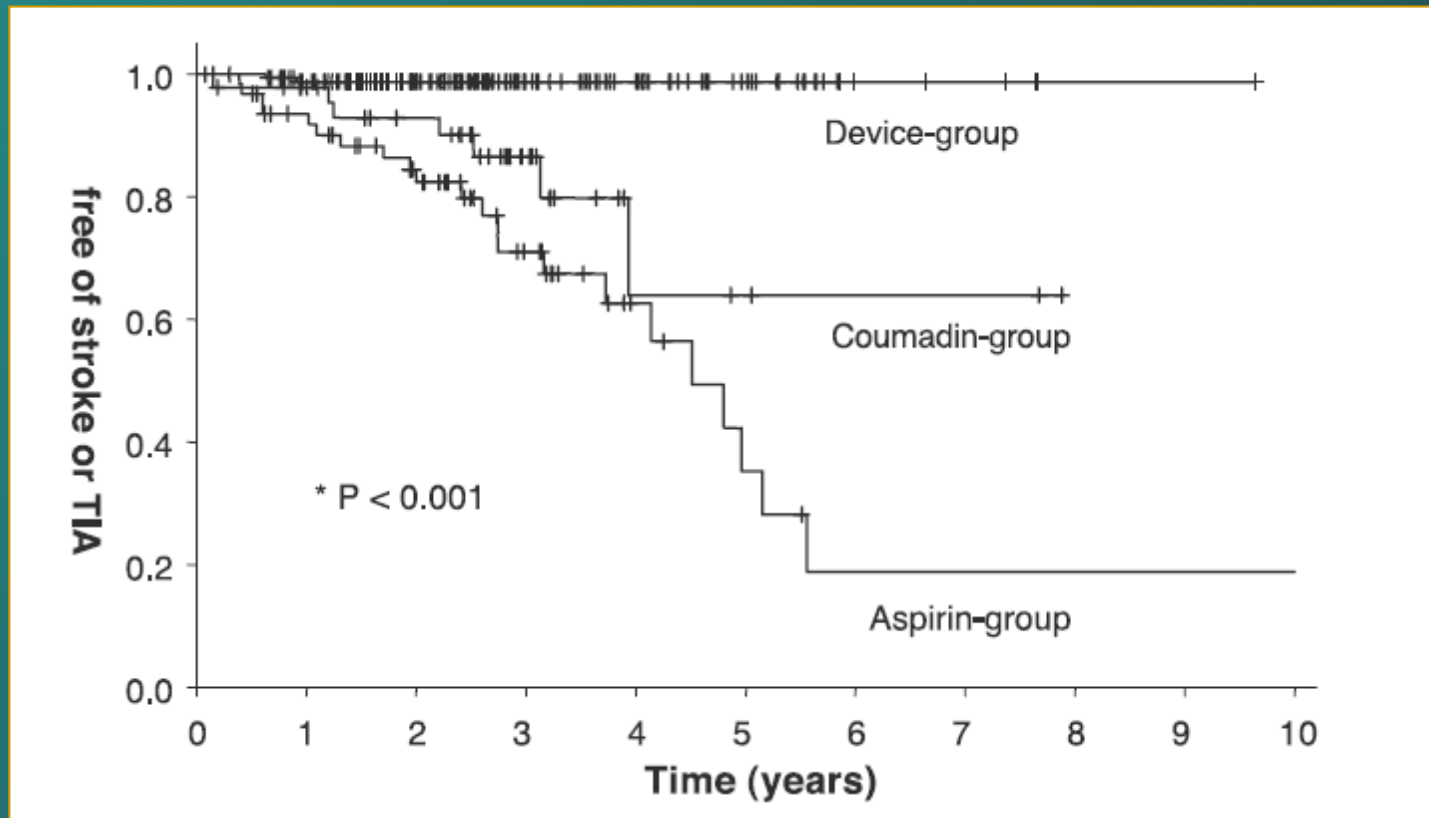
PFO: Prevention of Recurrent Embolic Events

- Lifelong Anticoagulant / Antiplatelet Rx
- Surgical Closure (Open Heart)
- Percutaneous Transcatheter Closure



Secondary Stroke Prevention

Schuchlenz et al 2005



Il percorso diagnostico-terapeutico del Forame Ovale Pervio Documento di indirizzo

a cura della Commissione Cardiologica e Cardiochirurgica Regionale

aprile 2014

Aggiornamento documento maggio 2009

Indicazioni cliniche raccomandate

Pazienti con evento ischemico cerebrale/ sistemico criptogenetico

- Nei pazienti di età inferiore/uguale a 55 anni, con diagnosi di evento ischemico cerebrale e/o sistemico criptogenetico, è giustificato l'avvio dell'iter diagnostico finalizzato alla ricerca di un forame ovale pervio con shunt dx/sn
- Nei pazienti di età superiore a 55 anni e diagnosi di evento ischemico cerebrale e/o sistemico criptogenetico, l'avvio dell'iter diagnostico finalizzato alla ricerca del forame ovale pervio dovrà essere valutato caso per caso, preferibilmente escludendo pazienti ad alto rischio cardiovascolare
- La diagnosi di evento ischemico cerebrale (TIA/STROKE) criptogenetico, deve essere formulata da un neurologo, preferibilmente con competenze vascolari, se disponibile (vedi appendice 2)

Clinical Syndromes

PFO and Migraine Headache

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Clinical Syndromes

PFO and Migraine Headaches

- A significant number of stroke patients have a history of classic migraine
- As PFO closure for stroke has become more prevalent, patients with migraine history have reported the elimination of migraine symptoms or reduction in frequency / severity after PFO closure

Il percorso diagnostico-terapeutico del Forame Ovale Pervio Documento di indirizzo

a cura della Commissione Cardiologica e Cardiochirurgica Regionale

aprile 2014

Aggiornamento documento maggio 2009

Pazienti emicranici

- Nei pazienti emicranici con o senza aura, in assenza di sintomatologia neurologica focale di verosimile genesi vascolare, non è giustificato l'avvio dell'iter diagnostico finalizzato a ricercare il forame ovale pervio, anche in presenza di piccole lesioni multiple della sostanza bianca alla RM cerebrale.
- Nei pazienti emicranici è giustificato l'avvio dell'iter diagnostico finalizzato alla ricerca del forame ovale pervio solo in presenza di evento ischemico cerebrale criptogenetico o ictus emicranico.

Clinical Syndromes

PFO and Decompression Illness

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Columbia University Medical Center*



Clinical Syndromes

PFO and Decompression Illness

- Link between recurrent decompression illness and PFO with right to left shunt
 - Presumably related to right to left shunt of air bubbles to cerebral circulation
 - Efficacy of PFO closure in preventing recurrence unproven

Il percorso diagnostico-terapeutico del Forame Ovale Pervio Documento di indirizzo

a cura della Commissione Cardiologica e Cardiochirurgica Regionale

aprile 2014

Aggiornamento documento maggio 2009

Subacquei

- Lo svolgimento di attività subacquea di per sé non giustifica l'avvio dell'iter diagnostico finalizzato alla ricerca del forame ovale pervio
- In caso di episodi ripetuti di incidente/infortunio da decompressione 'immeritato', è giustificata la ricerca di shunt dx-sin e del substrato anatomico che lo sottende

Transcatheter Closure of PFO

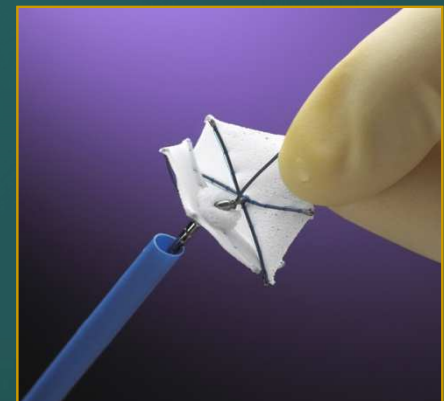
Double Occluder Devices in Clinical Use



Amplatzer



NMT Medical



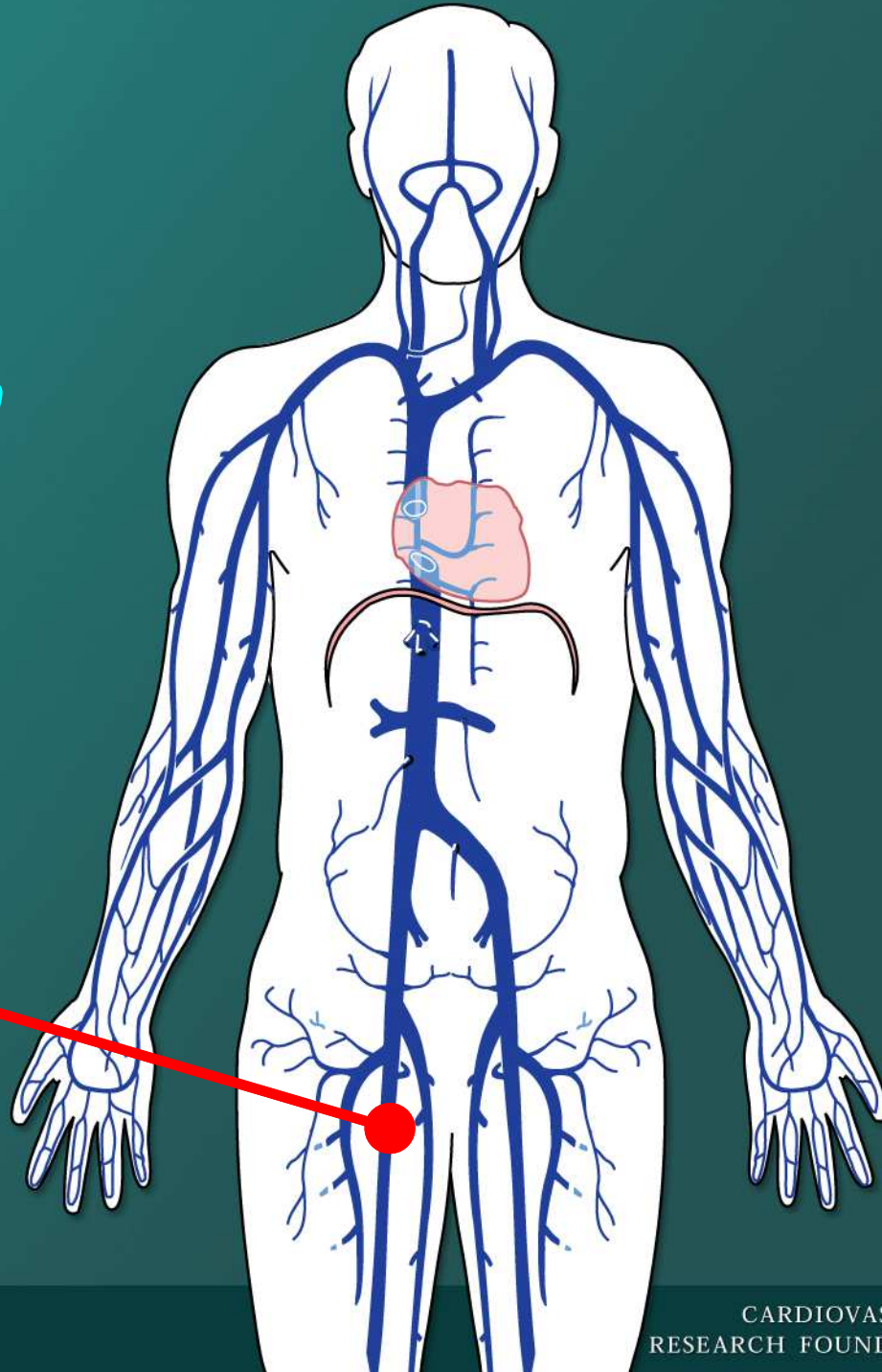
Cardia



Transcatheter Closure of PFO

Generalized Current Approach

*Site of catheter entry
into femoral vein*



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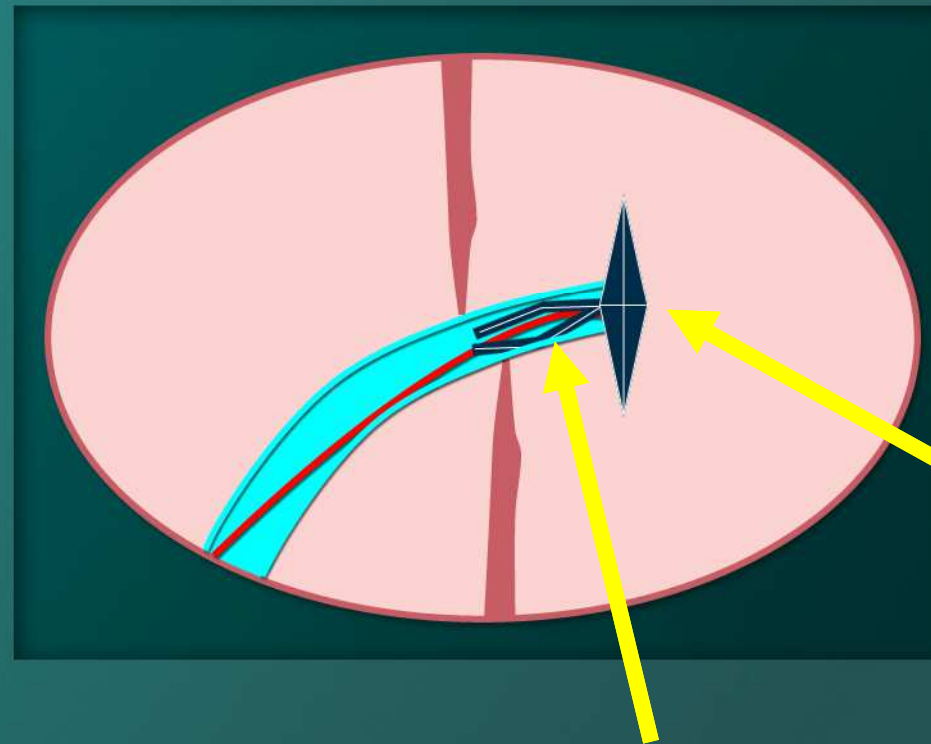
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Transcatheter Closure of PFO

Generalized Current Approach

**Right
Atrium**



**Left
Atrium**

*Left-sided
occluder
opened in LA.*

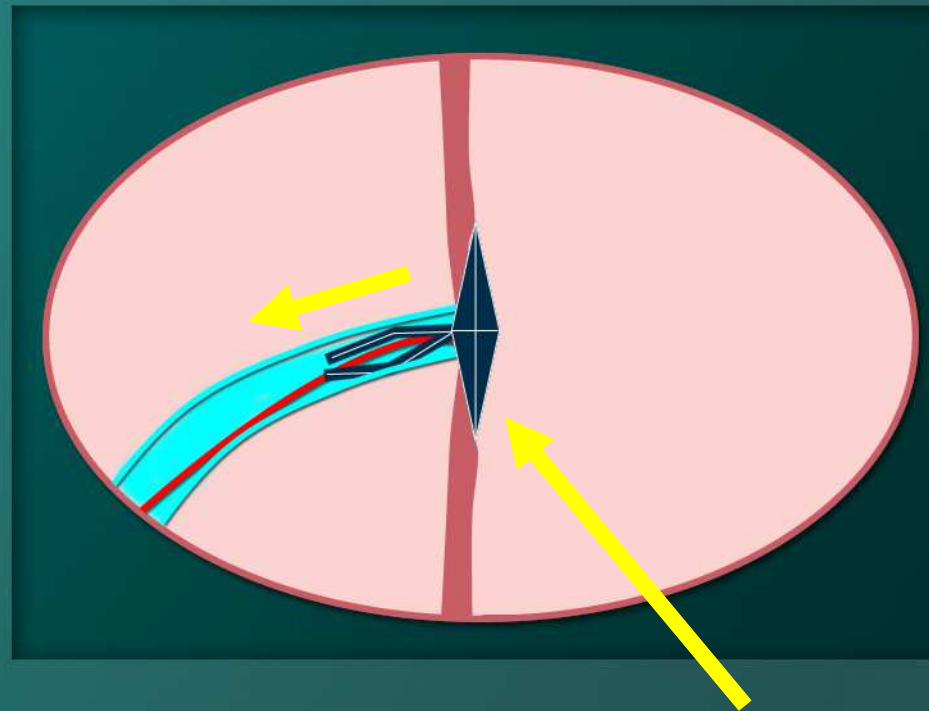
*Right-sided occluder remains
folded within delivery catheter.*



Transcatheter Closure of PFO

Generalized Current Approach

**Right
Atrium**



**Left
Atrium**

*Left-sided occluder pulled back
against flap of PFO, sealing it.*



Transcatheter Closure of PFO

Procedural Risks

- **Serious complications ~1/500 cases, few are life-threatening, but may include:**
 - **Thromboembolism**
 - **Air embolism**
 - **Device embolization**
 - **Cardiac perforation**

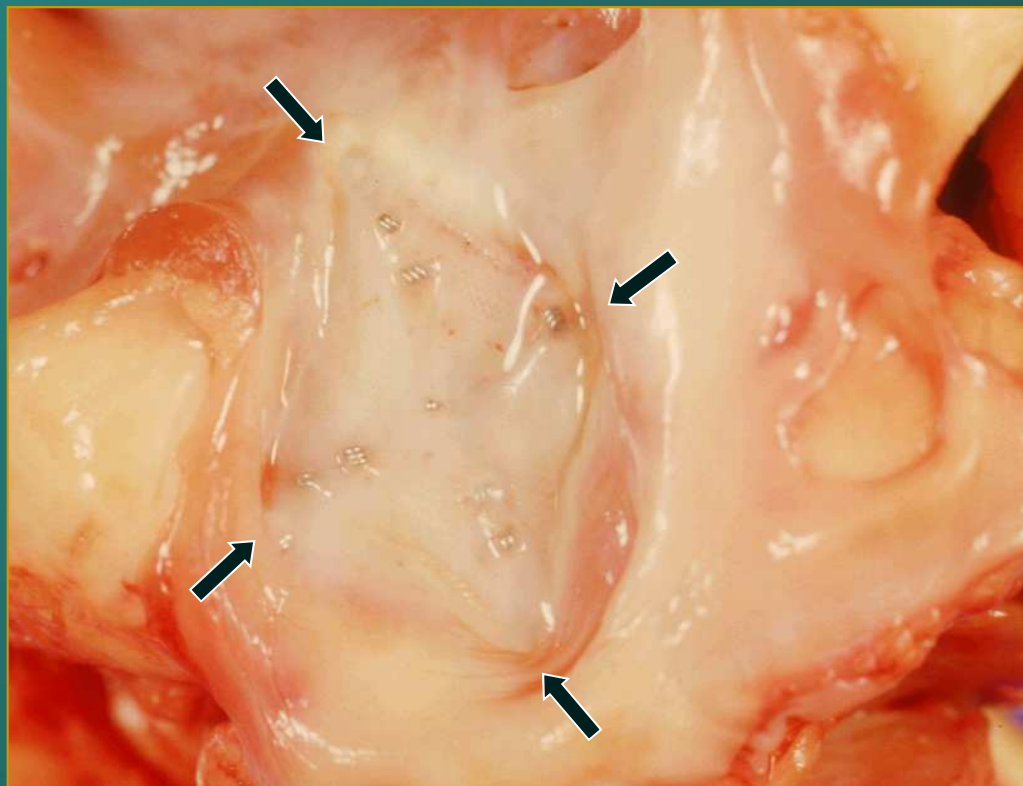
Transcatheter Closure of PFO

Potential Procedural Benefits

- The “Good News”:
 - 30-60 minute procedure
 - Less pain than surgery, no scar
 - No long term anti-coagulation
 - Return to full activity in 5 days

Transcatheter Closure of PFO

Device Endothelialization: CardioSEAL



Device thoroughly endothelialized by 6 months



Conclusions

The Future of PFO Closure

- Within a decade, a variety of catheter techniques will be available such that each may be best applied to specific anatomic variants
- Within a decade, closure procedures for PFO may be second in frequency only to coronary intervention in the cath lab



GRAZIE DELL'ATTENZIONE !



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