

Imaging In Endocarditis, what is new in 2017

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- IE is a disease of multisystem involvement, master of disguise
- Despite high achievements in medicine and antibiotics, disease is getting more and aggressive and complicated
- At the same time its incidence is increasing



Diagnosing IE

Definite:

Pathological

Clinical; 2 major, 1 major & 3 minor, 5 minor

Possible:

1 major criterion and 1 minor criterion; or

3 minor criteria

*Definite, Possible, Rejected
Clinical diagnosis &
Pathological diagnosis*

Rejected:

Firm alternative diagnosis explaining evidence of IE; or

Resolution of IE syndrome with antibiotic therapy for 4 days; or

No pathological evidence of IE at surgery or autopsy, with antibiotic therapy for 4 days; or

Does not meet criteria for possible IE as above

- Need to investigate not only the heart but different body system
- To complete diagnostic criteria and to rule out complications

1. *Cardiac Imaging*
2. *Non Cardiac Imaging*



I. Cardiac Imaging



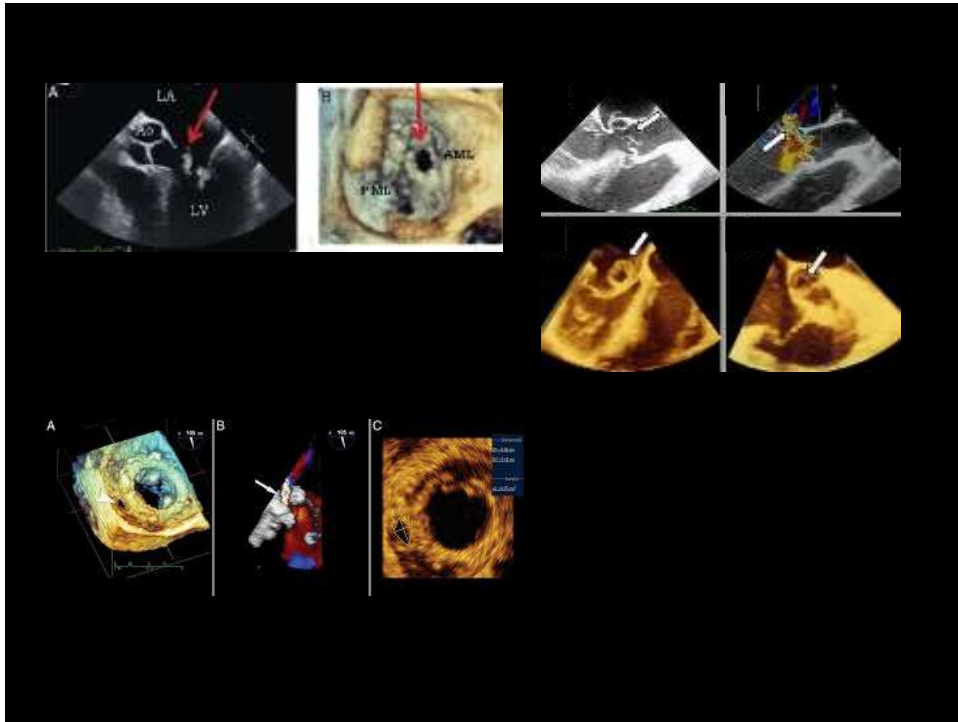
3D Echocardiography

- 3D TEE have demonstrated advantages over 2-dimensional TEE to better detect and delineate vegetations and to identify IE Complications
- Allows the analysis of 3D volumes of cardiac structures in any possible plane
- Better analysis of vegetation morphology and size may lead to better prediction of the embolic risk



- Particularly useful in the assessment of perivalvular extension of the infection, prosthetic valve dehiscence and valve perforation
- ***Conventional 2D TTE and TEE will remain the corner stone to diagnose IE and its complications***





MSCT Cardiology

- Key use of CT in IE is the *non-invasive assessment of the coronaries* prior to surgery, esp. in AV IE, where coronary angiography is associated with risk of systemic embolization & aortic wall perforation
- Assessment of *perivalvular extension* especially in PVE & with extensive calcifications
- Possibly superior in information regarding the extent and consequences of perivalvular extension, including the anatomy of pseudoaneurysms, abscesses and fistulae



KASR ALAINY

- NVE & PVE results of *MSCT* are comparable to intra-operative findings, and with no significant difference to TTE & TEE
- *Cerebral* & *Abdominal* CT could be performed in the same setting



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Multislice Computed Tomography in Infective Endocarditis

Comparison With Transesophageal Echocardiography and Intraoperative Findings

Results

The diagnostic performance of CT for the detection of evident valvular abnormalities for IE compared with TEE was: sensitivity 97%, specificity 88%, positive predictive value (PPV) 97%, and negative predictive value (NPV) 88% on a per-patient basis ($n = 37$; excellent intermodality agreement $\kappa = 0.84$). CT correctly identified 26 of 27 (96%) patients with valvular vegetations and 9 of 9 (100%) patients with abscesses/pseudoaneurysms compared with the intraoperative specimen. On a per-valve-based analysis, diagnostic accuracy for the detection of vegetations and abscesses/pseudoaneurysms compared with surgery was: sensitivity 96%, specificity 97%, PPV 96%, NPV 97%, and sensitivity 100%, specificity 100%, PPV 100%, NPV 100%, respectively, without significant differences as compared with TEE. Vegetation size measurements by CT correlated ($r = 0.95$; $p < 0.001$) with TEE (mean 7.6 ± 5.6 mm). The mobility of vegetations was accurately diagnosed in 21 of 22 (96%) patients with CT, but all of 4 leaflet perforations (≤ 2 mm) were missed. CT provided more accurate anatomic information regarding perivalvular extent of abscess/pseudoaneurysms than TEE.

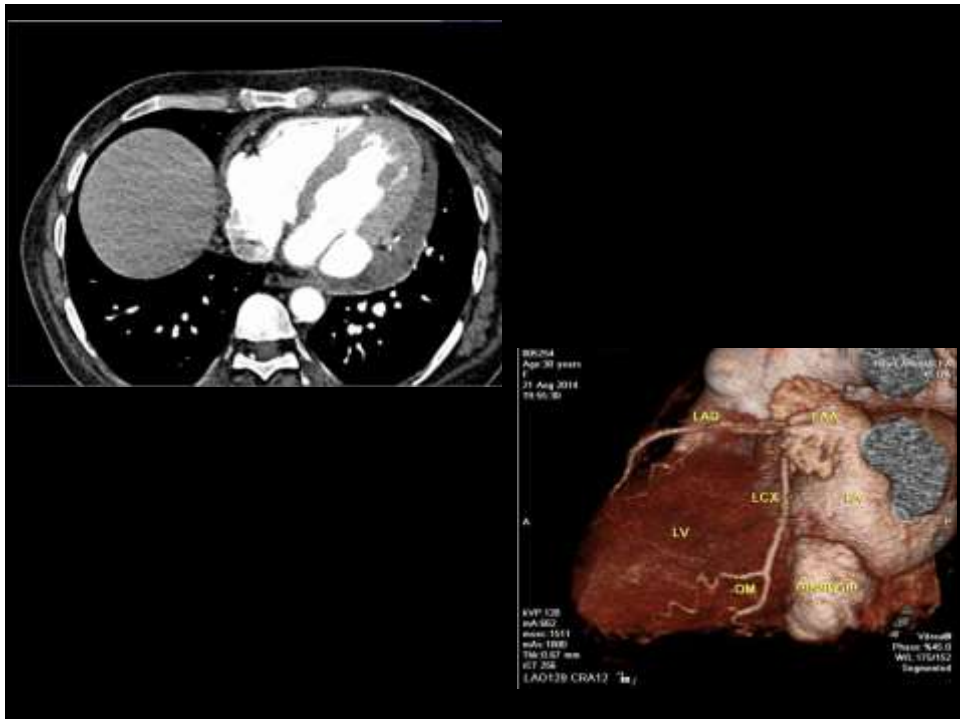
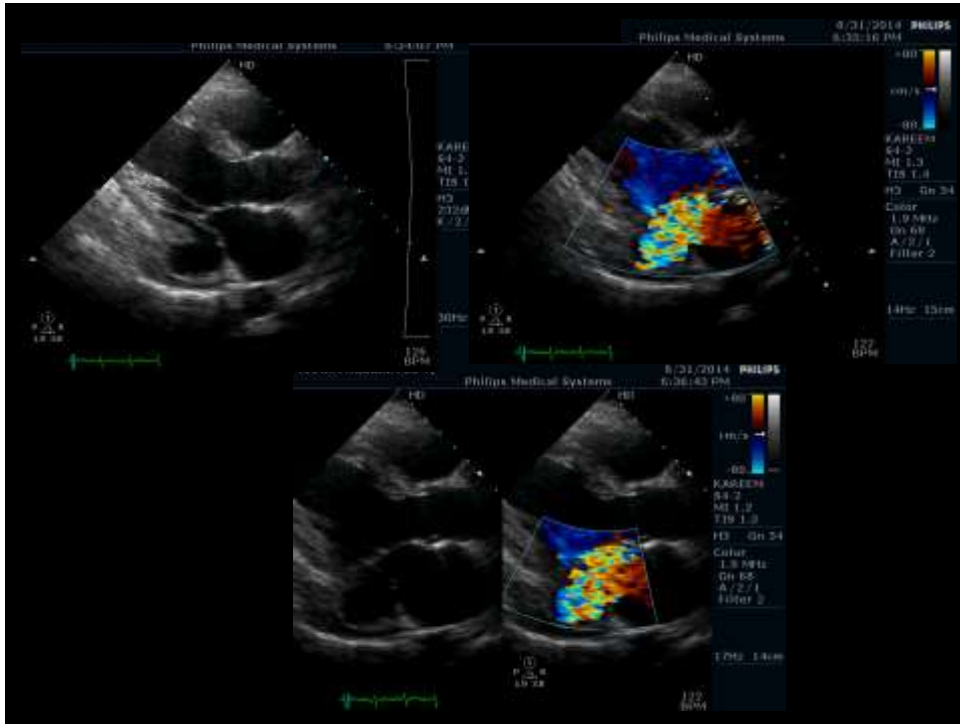
Results

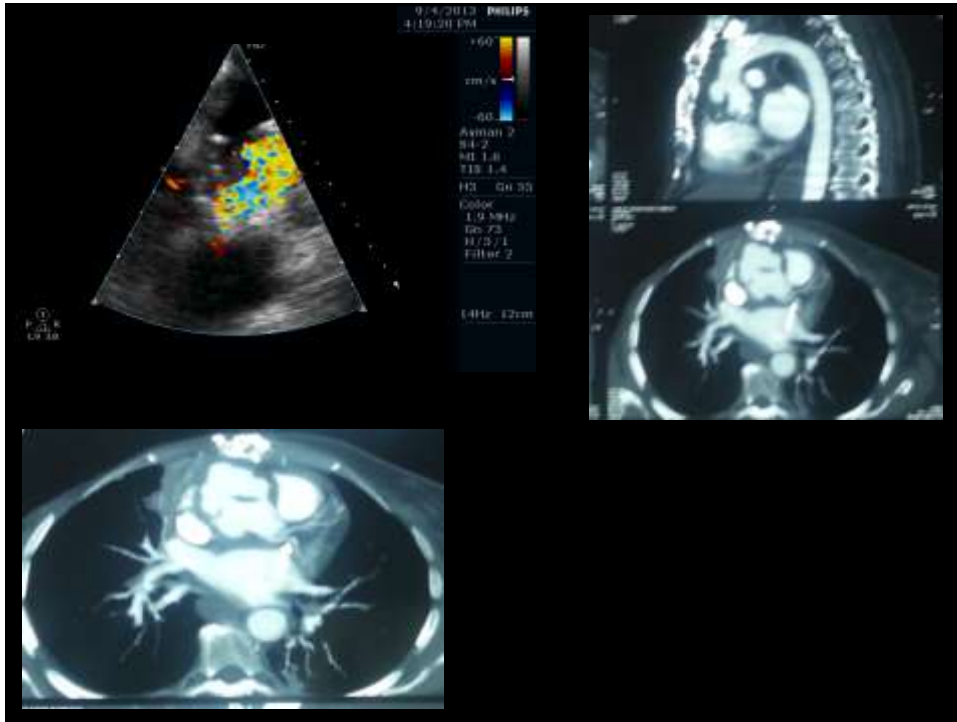
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Conclusions

Multislice CT shows good results in detecting valvular abnormalities in IE and could be applied in pre-operative planning and exclusion of coronary artery disease before surgery. (J Am Coll Cardiol 2009;53:436-44)

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MSCT Cardiography

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- Information regarding the extent, consequences and anatomy of perivalvular extension: pseudoaneurysms, abscesses and fistulae



KASR ALAINY

F-fluorodesoxyglucose (F-FDG) PET-CT

- Few reports are existing, mainly in PVE, where abnormal FDG uptake around cardiac prosthesis may help in early diagnosis
- Helpful to differentiate active IE from old healed infection
- Less valuable in NVE, however might be helpful in detecting perivalvular extension
- Extracardiac spread of infection



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- All of 3 or a majority of ≥ 4 separate cultures of blood (with first and last samples drawn ≥ 1 h apart); or
- c. Single positive blood culture for *Coxiella burnetii* or phase I IgG antibody titre $> 1:800$

2. Imaging positive for IE

- Echocardiogram positive for IE:
 - Vegetation;
 - Abscess, pseudoaneurysm, intracardiac fistula;
 - Valvular perforation or aneurysm;
 - New partial dehiscence of prosthetic valve.
- Abnormal activity around the site of prosthetic valve implantation detected by ^{18}F -FDG PET/CT (only if the prosthesis was implanted for > 3 months) or radiolabelled leukocytes SPECT/CT.
- Definite paravalvular lesions by cardiac CT.

Minor criteria

- Predisposition such as predisposing heart condition, or injection drug use.
- Fever defined as temperature $> 38^\circ\text{C}$.
- Vascular phenomena (including those detected by imaging only): major arterial emboli, septic pulmonary infarcts, infectious (mycotic) aneurysm, intracranial haemorrhage, conjunctival haemorrhages, and Janeway's lesions.

II. Non Cardiac Imaging



- CNS gets a major share (65%) of the embolic events
- Neurologic complications, dramatically change the prognosis & affect ttt plan
- Such complications are clinically apparent in 20% - 40% of cases
- True incidence of acute brain embolization is not actually known



- In one study, findings of cerebral MRI upgraded the diagnosis of IE in 25% of patients presenting initially with non-definite IE



Annals of Internal Medicine

ARTICLE

Effect of Early Cerebral Magnetic Resonance Imaging on Clinical Decisions in Infective Endocarditis

A Prospective Study

Xavier Duval, MD, PhD; Bernard Jung, MD; Isabelle Klein, MD, PhD; Eric Brechet, MD; Gabriel Thibaut, MD, PhD; Florence Arrouf, MD; Laurent Legagne, MD; Jean-Pierre Laine, MD, PhD; Michel Wolff, MD; and Catherine Lepout, MD, PhD, for the IMAGE (Resonance Magnetic Imaging at the Acute Phase of Endocarditis) Study Group*

Background: Neurologic complications of endocarditis can influence diagnosis, therapeutic plans, and prognosis.

Objective: To describe how early cerebral magnetic resonance imaging (MRI) affects the diagnosis and management of endocarditis in hospitalized adults.

Design: Single-center prospective study between June 2005 and October 2008. (ClinicalTrials.gov registration number: NCT00144882)

Setting: Tertiary care university hospital in France.

Patients: 130 patients with endocarditis.

Intervention: Central MRI with angiography performed up to 7 days after admission and before any surgical intervention.

Measurements: 2 experts jointly established the endocarditis diagnostic classification (according to Duke-modified criteria) and therapeutic plans just before and after MRI and then compared them.

Results: Endocarditis was initially classified as definite in 77 patients and possible in 50 and was upgraded in 25 patients (17%). But with neurologic symptoms, cerebral lesions were detected by MRI in 106 patients (81% [95% CI, 75% to 86%]), including 16 central lesions in 60, microhemorrhages in 74, and absent areas

system in 30. Solely on the basis of MRI results and excluding microhemorrhages, diagnostic classification of 37 of 53 (23%) cases of nondiagnostic endocarditis was upgraded to either definite (14 patients) or possible (3 patients). Endocarditis therapeutic plans were modified for 33 (25%) of the 130 patients, including surgical plan modifications for 18 (14%). Overall, early MRI led to modifications of diagnosis or therapeutic plan in 36 patients (28% [CI, 20% to 36%]).

Limitation: Investigators did not assess whether the MRI-related changes in diagnosis and therapeutic plans improved patient outcomes or led to unnecessary procedures and increased costs.

Conclusion: Cerebral lesions were identified by MRI in many patients with endocarditis but no neurologic symptoms. The MRI findings affected both diagnostic classifications and clinical management plans.

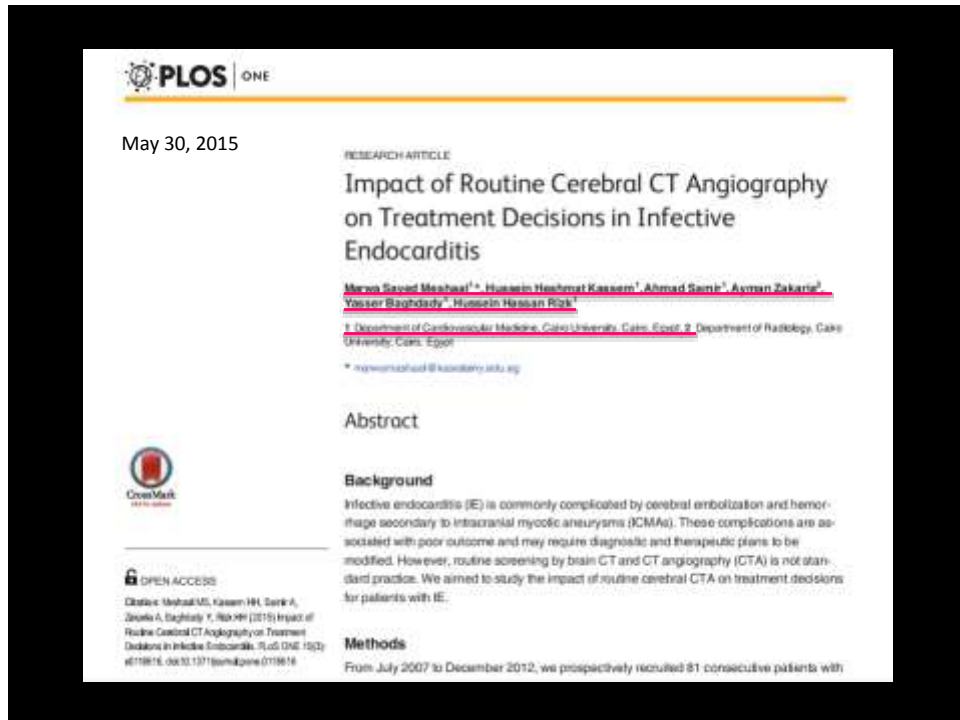
Primary Funding Source: French Ministry of Health.

Ann Intern Med. 2013;152:487-494.

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For author disclosures, see end of text.

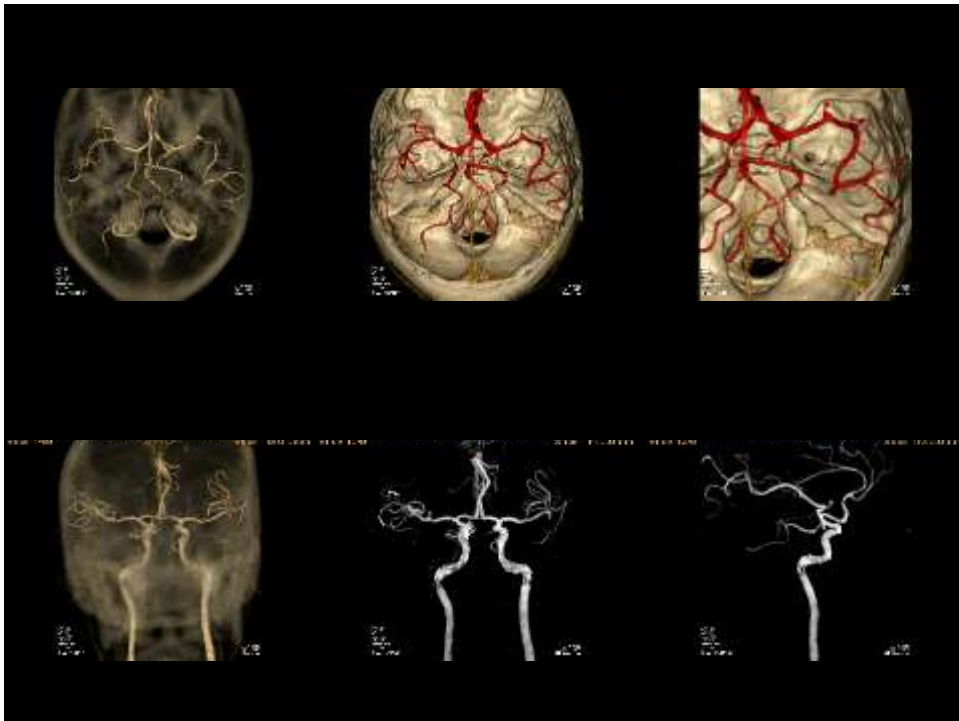
* For members of the IMAGE Study Group, see the Appendix (available at www.annals.org).

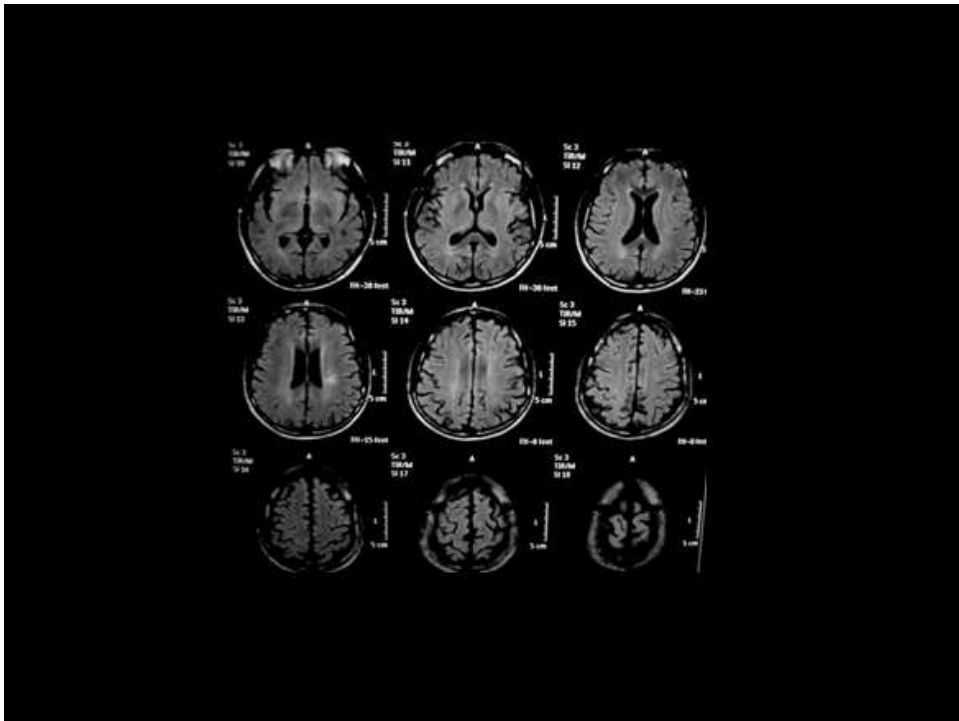
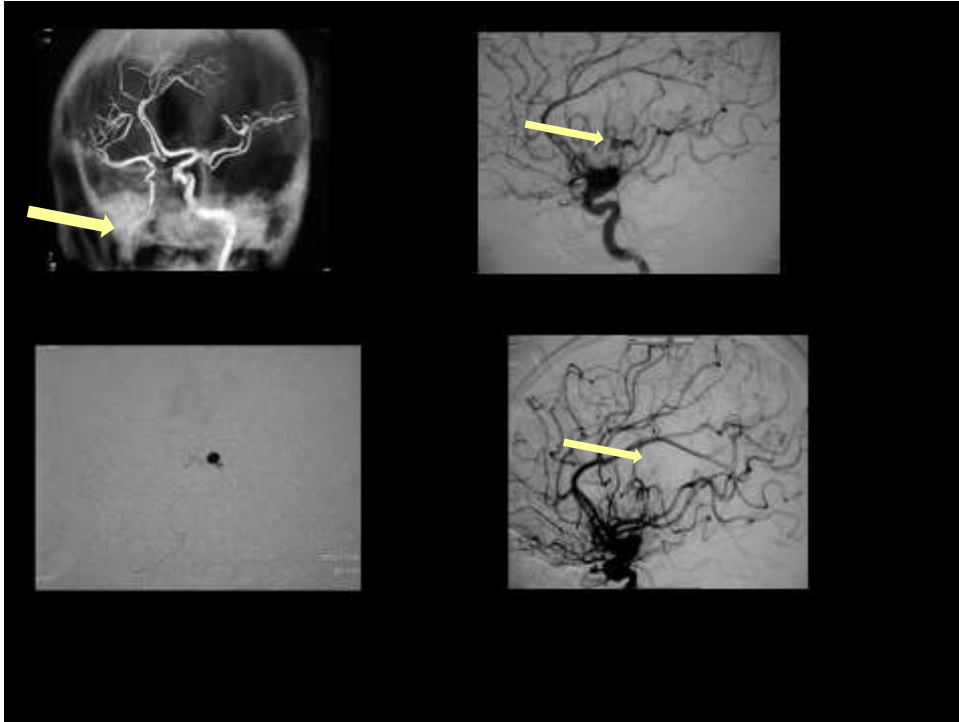


- July 2007 to Dec. 2012 carried out by IE working group Kasr El-Ainy
- 81 consecutive patients had definite left side IE
- Patients underwent CTA within 1 wk
- 34 patients had symptomatic CNS embolization
- ICMA occurred in 26(32%) patients; 15(18.5%) were silent
- CTA findings changed treatment plan in 21 patients (25.6%); 11 were neurologically free



Brain CT & CT angiography





Thank you