

원인불명 색전뇌졸중에서 이식형 사건기록기의 역할



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서울의대 순환기내과

Implantable loop recorder in ESUS

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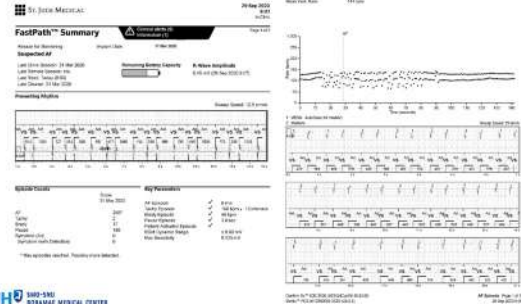
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CASE

- F/79
- HT, dyslipidemia
- 3YA, Lt. PICA infarction, mech: cryptogenic, med: ASA
- 2020.3 Rt. Side weakness d/t Lt. MCA infarction
 - s/p tPA → DAPT
 - mech: r/o CE
- Holter: SR, rare VPBs, occasional SVPBs with short run ATs
- ILR insertion before discharge

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ILR analysis



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Embolic Stroke of Undetermined Source (ESUS)

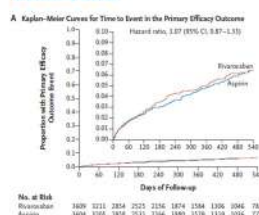
- ESUS represent approximately 20% of ischemic strokes
- Annual recurrence rate of stroke is 4~5%
- Atrial fibrillation (AF) is detected in 15~30% of ESUS patients during long-term follow-up
 - Recently, detection of subclinical AF is more increasing by cardiac implanted electronic devices (CIEDs) and wearable devices



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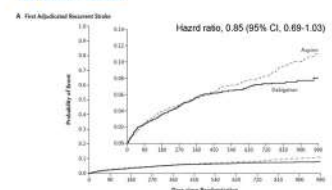
Secondary prevention of stroke in patients with ESUS

NAVIGATE ESUS



Hart et al. N Engl J Med 2018;378:2191-201.

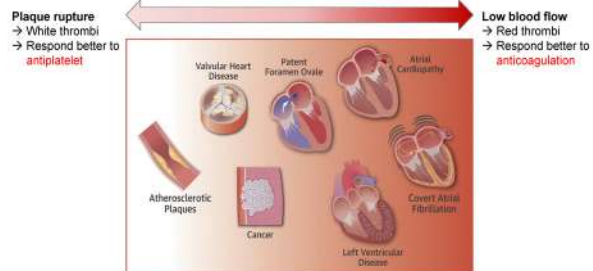
RE-SPECT ESUS



Diener et al. N Engl J Med 2019;380:1906-17.

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Main pathologies associated with ESUS

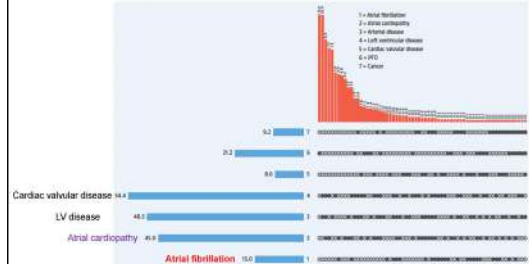


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Ntaios et al. J Am Coll Cardiol 2020;75:333-40

AF detection is important

Prevalence of potential embolic source and degree of their overlap in the AF-ESUS study

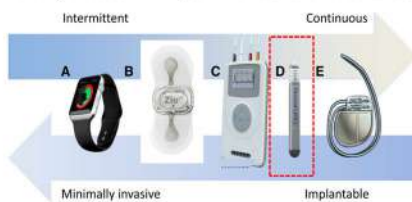


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Ntaios et al. J Am Coll Cardiol 2020;75:333-40

AF detection is increasing

The range of devices that allow detection of **subclinical AF (SCAF)** extends from wearables that allow intermittent rhythm assessment to implanted devices that allow continuous surveillance



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Noseworthy et al. Circulation. 2019;140:e944-e963.

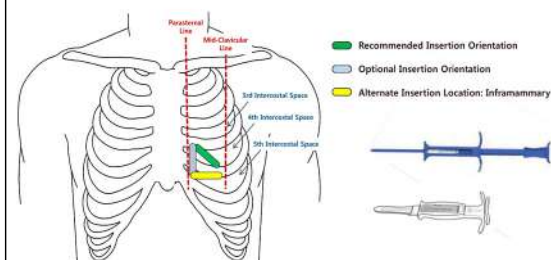
What is ILR (Implantable Loop Recorder) ?

- ICM (intracardiac monitoring)
- One-third the size of a AAA battery
- Up to a 3-year longevity for long-term monitoring
- MR Conditional
- Minimally invasive, simplified insertion procedure



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Simple Insertion Procedure



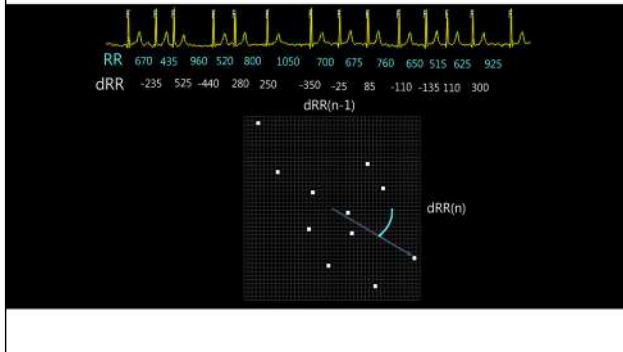
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ILR Indications

- **Cryptogenic stroke:** atrial fibrillation (AF) detection
- **Unexplained syncope:** bradycardia detection
- **Palpitation:** tachycardia detection

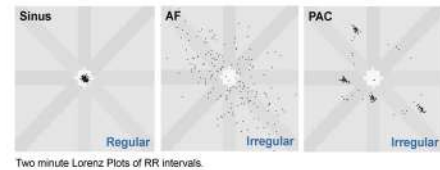
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AF detection Algorithm: Lorenz Plot



AF detection

- AF detection through discrimination of true AF from other regular and irregular rhythms.



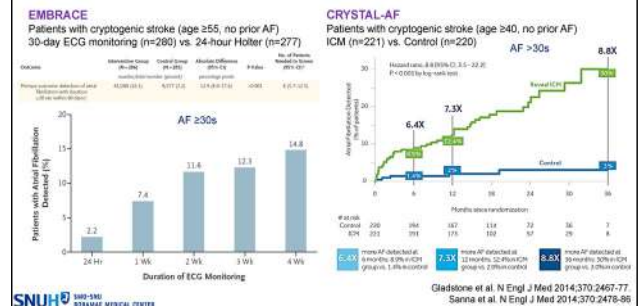
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Definitions of Arrhythmic Events

- SCAF (Subclinical AF):** asymptomatic episodes of AF detected and confirmed by intracardiac electrograms and not previously detected by ECG or ambulatory monitoring
- SCAT (Subclinical atrial tachyarrhythmias):** asymptomatic episodes of AF, AFL, or AT detected and confirmed by intracardiac electrograms and not previously detected by ECG or ambulatory monitoring
- AHRE (Atrial high-rate episodes):** device-detected atrial events, usually tachyarrhythmias, meeting programmed or other specified atrial high-rate criteria (usually ranging between 175 and 220 bpm)

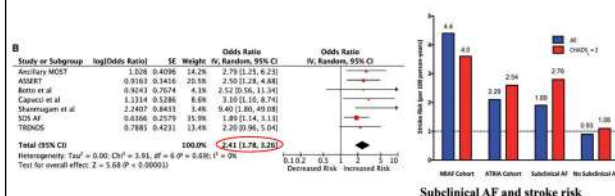
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Intensive ECG monitoring in Cryptogenic stroke



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SCAF and Stroke Risk

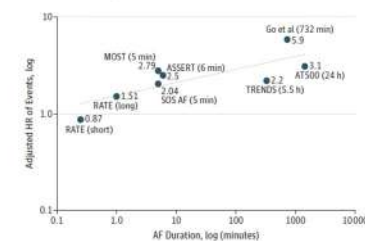


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Mahajan et al. European Heart Journal (2018) 39, 1407–1415.

SCAF duration and HR for thromboembolism

Dose relationship between AF duration and stroke risk



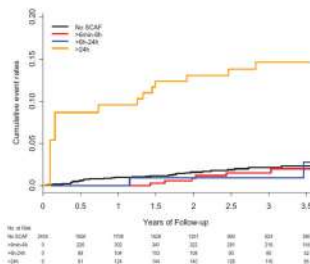
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Steinberg et al. JAMA Cardiol. 2018;3:559–560.

Stroke/systemic embolism by SCAF durations

ASSERT
2580 patients with PM or ICD
Age >65, HT, no prior AF

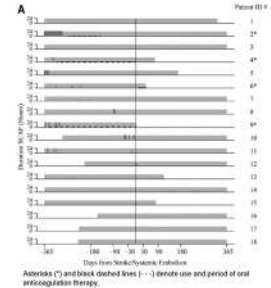
Conclusion
SCAF >24h is associated with an increased risk of ischemic stroke or systemic embolism



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Van Gelder et al. European Heart Journal (2017) 38, 1339–1344.

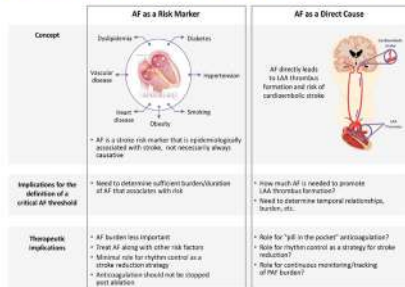
Temporal relationship btw SCAF and stroke/SE



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Brambatti et al. Circulation. 2014;129:2094-2099.

AF as a risk marker vs. AF as a direct cause of stroke

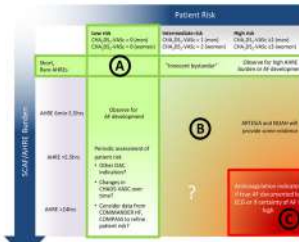


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Noseworthy et al. Circulation. 2019;140:e944-e953.

Potential approach to patients with SCAF

A potential approach to patients with SCAF could consider both patient risk (as gauged by the CHA₂DS₂-VASc score) and SCAF burden/duration.



- Patients at low risk or with short and infrequent atrial high-rate episodes (AHREs) do not require anticoagulation.
- Patients with intermediate risk and AHREs lasting >6 minutes to 24 hours are an uncertain population but are currently under study in 2 prospective randomized controlled trials.
- Patients at high risk with longer episodes could be considered reasonable candidates for anticoagulation, although the precise threshold for SCAF duration remains uncertain.

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Noseworthy et al. Circulation. 2019;140:e944-e953.

Summary

- ESUS represent approximately 20% of ischemic strokes and AF is detected in 15–30% of ESUS patients during long-term follow-up.
- Discovery of SCAF with CIEDs (e.g. ILR) and wearable monitors is common, especially in populations known to have an increased risk of stroke (or recurrent stroke).
- SCAF detection SCAF provides an opportunity to reduce the risk of embolic stroke, but number of factors should be considered before long-term anticoagulation
 - The accuracy of SCAF detection should be confirmed by a review of electrograms to exclude false positives
 - The longest continuous episode and highest daily burden should be quantified because stroke risk increases with the duration/burden of SCAF.
 - Clinicians should assess the traditional stroke risk factors (age, DM, HT, and HF...)

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