

External validation of multiple prognosis scores to determine the impact of echocardiography in patients with *Staphylococcus aureus* bacteremia using a prospective cohort

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Définitions

- *Staphylococcus aureus* (SA)
- Bactériémie
- Endocardite infectieuse (EI)
- Dispositif électronique intracardiaque (DEIC)



Endocardite infectieuse

- **Diagnostic difficile**
- **Traitement médico-chirurgical**
- **Critères de Duke modifiés**

Critères de Duke modifiés

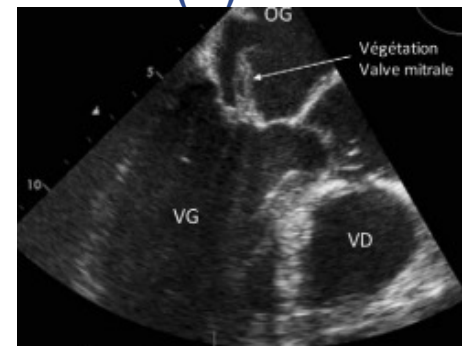
CRITERES MAJEURS

- Hémocultures
- Echocardiographie



CRITERES MINEURS

- Cardiopathie à risque ou Toxicomanie intraveineuse (IV)
- Fièvre $\geq 38^{\circ}$ C
- Phénomène vasculaire
- Phénomène immunologique
- Argument microbiologique non majeur

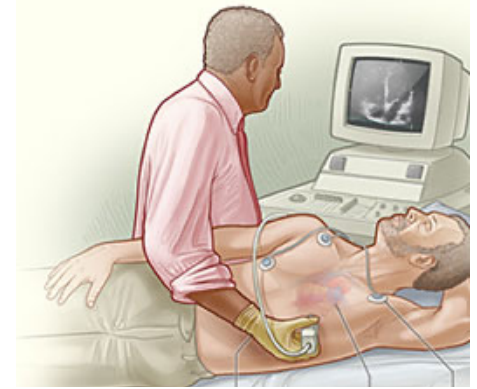


« Li et al. *Clinical Infectious Diseases* 2000 »

Echocardiographie

TRANS-THORACIQUE
(ETT)

- Accès facile
- Sensibilité 30-70%



TRANS-OESOPHAGIENNE
(ETO)

- Sensibilité 90%
- Moins accessible
- Invasive



« Wong et al. *European Journal of Clinical Microbiology & Infectious Diseases* 2014 », « Bai e t al. *Clinical Microbiology and Infection* 2017 », « Ten Oever et al. *The Journal of Antimicrobial Chemotherapy* 2019 »

Echocardiographie

■ ESC Guidelines 2015

- Echocardiography should be considered in *Staphylococcus aureus* bacteraemia.



« Habib et al. European Heart Journal 2015 »

■ En vie réelle

- 40 à 70% BSA

« Holland et al. JAMA 2014 », « Joseph et al. Journal of Antimicrobial Chemotherapy 2013 »

Scores pronostiques d'EI

- 2015 : PREDICT
- 2016 : VIRSTA
- 2020 : POSITIVE

PREDICT

Predicting Risk of Endocarditis Using a Clinical Tool (PREDICT): Scoring System to Guide Use of Echocardiography in the Management of *Staphylococcus aureus* Bacteremia

Bharath Raj Palraj,¹ Larry M. Baddour,^{1,2} Erik P. Hess,³ James M. Steckelberg,¹ Walter R. Wilson,¹ Brian D. Lahr,⁴ and M. Rizwan Sohail^{1,2}

Divisions of ¹Infectious Diseases, and ²Cardiovascular Diseases, Department of Medicine, ³Department of Emergency Medicine and Center for Science of Healthcare Delivery, and ⁴Department of Biomedical Statistics and Informatics, Mayo Clinic College of Medicine, Rochester, Minnesota

- **Etude monocentrique rétrospective USA**
- **2006-2011**
- **678 patients**
- **72% ETO**
- **13% EI certaines**

PREDICT

PREDICT

Cutoff: ≥ 4 for D1 and ≥ 2 for D5

	points
ICD	2
Pacemaker	3
Acquisition community	2
Acquisition healthcare	1
Prolonged bacteriemia >72h	2

VPN 98,5 %

ETO si

■ **J1 ≥ 4**

- Risque EI : 41%

■ **J5 ≥ 2**

- Risque EI : 18,6%

VIRSTA

The VIRSTA score, a prediction score to estimate risk of infective endocarditis and determine priority for echocardiography in patients with *Staphylococcus aureus* bacteremia.

Sarah Tubiana ^{1,2}, Xavier Duval ^{1,2,*}, François Alla ^{3,4}, Christine Selton-Suty ⁵, Pierre Tattevin ^{6,7,8}, François Delahaye ⁹, Lionel Piroth ^{10,11}, Catherine Chirouze ^{12,13,14}, Jean-Philippe Lavigne ¹⁵, Marie-Line Erpelding ^{4,3}, Bruno Hoen ¹⁶, François Vandenesch ¹⁷, Bernard Lung ¹⁸, Vincent Le Moing ¹⁸

- **Etude multicentrique Française rétrospective**
- **2009-2012**
- **2008 patients**
- **30% ETO – 67% ETT**
- **11% EI certaine**

VIRSTA

VIRSTA	
Cutoff: ≥ 3	
	points
Cerebral or peripheral emboli	5
Méningitis	5
Permanent intracardiac device or previous IE	4
Intravenous drug use	4
Pre-existing native valve disease	3
Persistent bacteremia >48h	3
Community or Non nosocomial Health care associated acquisition	2
Vertebral osteomyelitis	2
Severe sepsis or shock	1
C-reactive protein > 190 mg/L	1

ETO si

- **VIRSTA ≥ 3**
 - Réévaluation à H48 si <3
- **Si VIRSTA <3**
 - Risque EI : 1,1%

VPN 98,8 %

POSITIVE

Time to blood culture positivity in *Staphylococcus aureus* bacteraemia to determine risk of infective endocarditis[☆]

Fredrik Kahn^{1,2,†}, Fredrik Resman^{1,6,†}, Sissela Bergmark¹, Peter Filiptsev¹, Bo Nilson^{5,3}, Patrik Gilje^{1,4}, Magnus Rasmussen^{1,2,*}

- Etude multicentrique Suédoise rétrospective
- 2016-2017
- 465 patients
- 35% ETO – 64% ETT
- 8,2% EI certaines

POSITIVE

POSITIVE	
Cut off: >4	
	points
TTG<9h	5
TTG 9-11h	3
TTG 11-13h	2
IV drug use	3
vascular phenomena	6
Predisposing heart disease	5

TTG : time to grow

ETO si

- **POSITIVE >4**

Objectifs de l'étude

Etude prospective, monocentrique Non interventionnelle

- **Principal : évaluer les performances des scores POSITIVE, PREDICT et VIRSTA**
- **Secondaire : proposer un algorithme de prise en charge des BSA**

Critère d'inclusion

- **Patients avec BSA au CHU Grenoble Alpes**
 - 22 Juillet 2020 au 21 Juillet 2021

Méthode

- Diagnostic BSA : inclusion
- Calcul des scores

BSA • POSITIVE, VIRSTA, PREDICT J1

H+48 • VIRSTA

H+96 • PREDICT J5

- Diagnostic d'EI selon Duke

Résultats

- 123 patients
- 89,4% ETT
- 27,6% ETO

- 12,2% EI certaine

Table III: Intrinsic validity and extrinsic performance of scores for the diagnosis of definite or excluded IE according to modified Duke

Definite IE					
Scores	Sensibility (%)	Specificity (%)	PPV (%)	NPV (%)	AUC
VIRSTA	100	41.7	19.2	100	91.7
PREDICT D1	0	92.6	0	87	70.3
PREDICT D5	100	68.5	30.6	100	88
POSITIVE	80	69.4	26.7	96.2	82.6
Excluded IE					
VIRSTA	97.1	50	43.6	97.8	92
PREDICT D1	17.1	97.7	75	74.8	73.3
PREDICT D5	85.7	78.4	61.2	93.2	87.2
POSITIVE	68.6	76.1	53.3	85.9	81.5

AUC: area under the curve, IE: infective endocarditis NPV: negative predictive value, PPV: positive predictive value]

Figure 2a: ROC curves of scores for the diagnosis of definite EI according to modified Duke

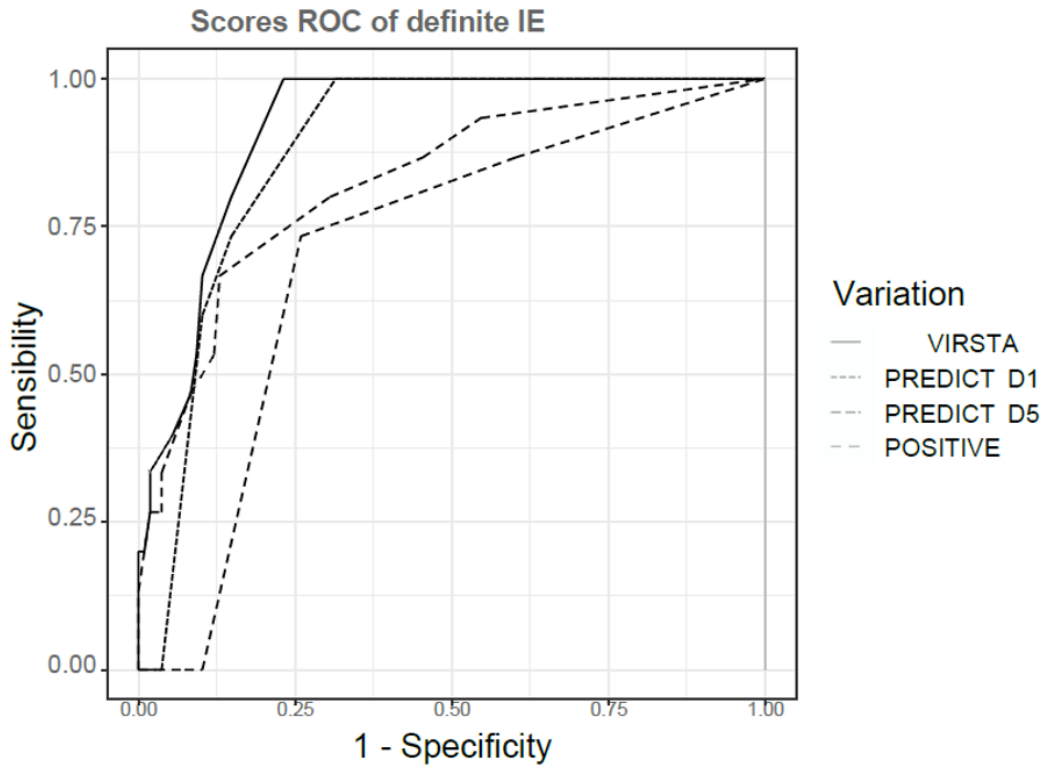
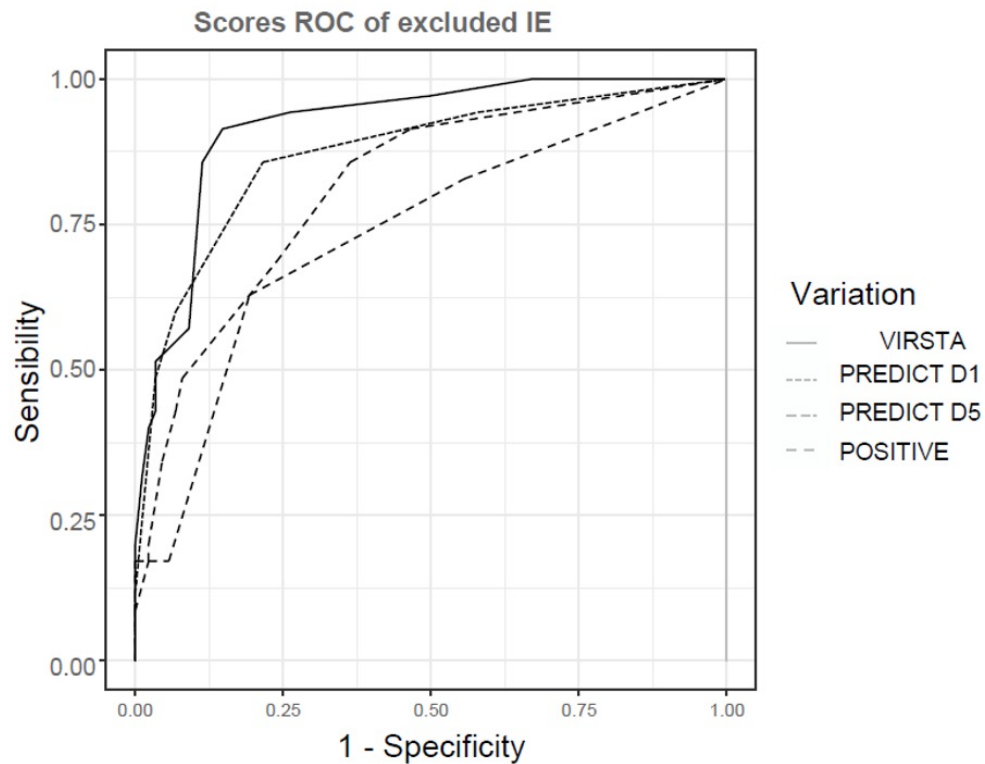


Figure 2b: ROC curves of scores to exclude the diagnosis of IE according to modified Duke



Discussion

Table IV: Paired comparison of the areas under the curve for the different scores for the diagnosis of definite or excluded IE

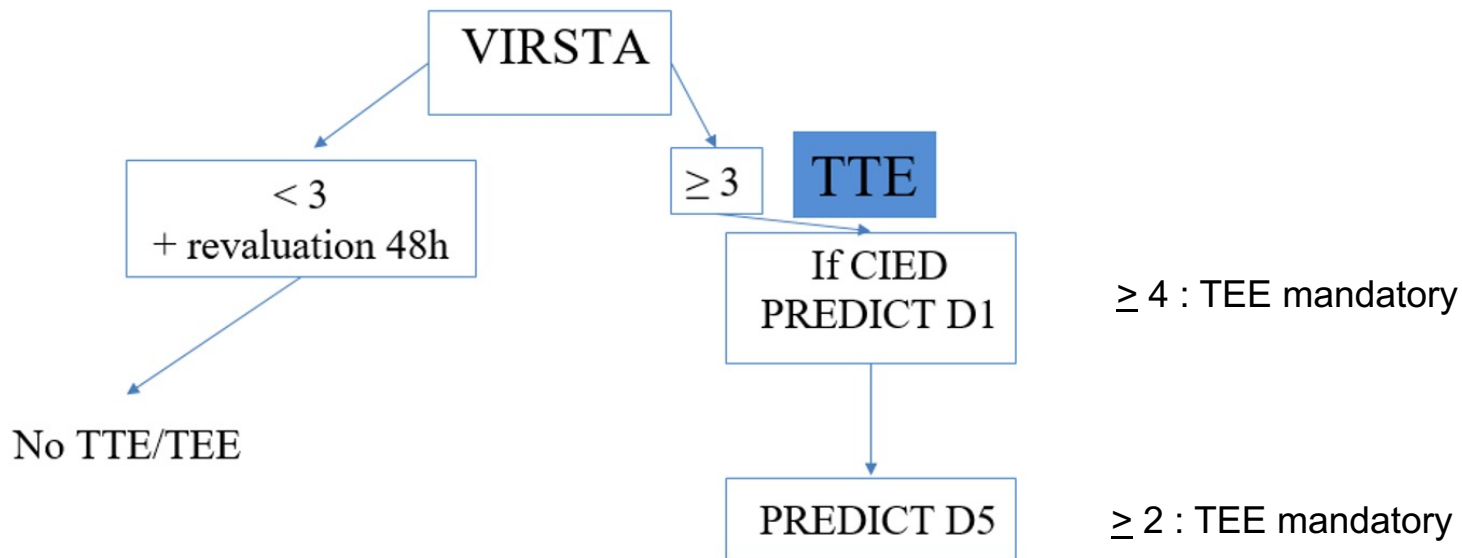
<u>Definite IE</u>	VIRSTA	PREDICT D1	PREDICT D5
VIRSTA			
PREDICT D1	< 0,001		
PREDICT D5	0,246	< 0,001	
POSITIVE	0,060	0,158	0,409
<u>Excluded IE</u>			
VIRSTA D2			
PREDICT J0	< 0,001		
PREDICT D5	0,182	< 0,001	
POSITIVE	0,005	0,184	0,281

The values are p-values.

IE: infective endocarditis.

Proposition d'algorithme décisionnel

SAB



Merci de votre attention