

**Donación en muerte encefálica.
¿Cómo hacemos posible el modelo sectorial
Con nuestra estructura?**

**Criterios de mal pronóstico relacionados con la
Evolución a muerte encefálica. ¿Cómo sé a qué
paciente es adecuado incluir en CIOD?**

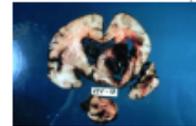
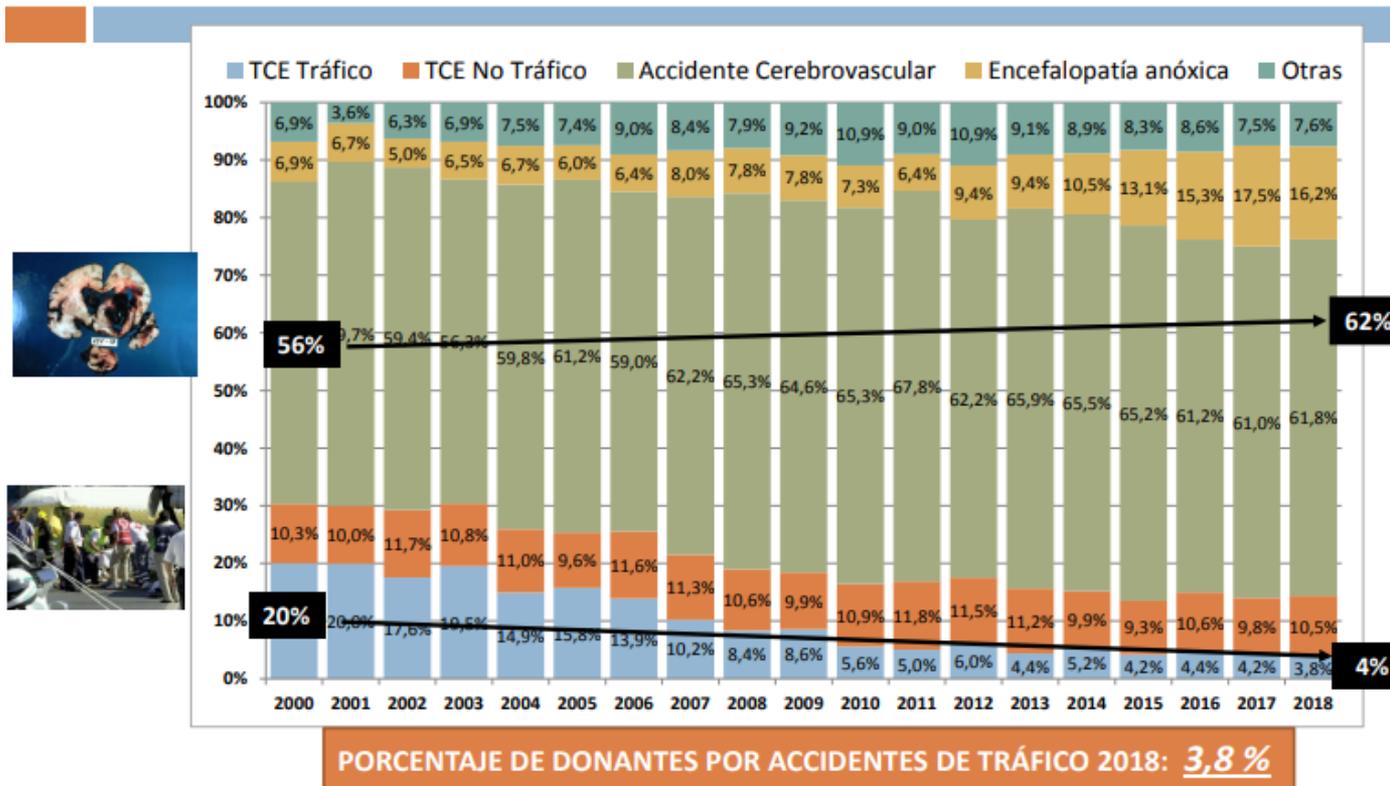
Y. Silva

Unitat d'Ictus. Hospital Universitari Dr Josep Trueta de Girona

20 de febrero de 2020

**4º Workshop. Desarrollo de un modelo sectorial de coordinación
de trasplantes en la Regió Sanitària de Girona a partir de los
servicios de urgencias y emergencias**

Causa de fallecimiento de los donantes de órganos



Fuente: Organización Nacional de Trasplantes



- Diferentes escenarios.....

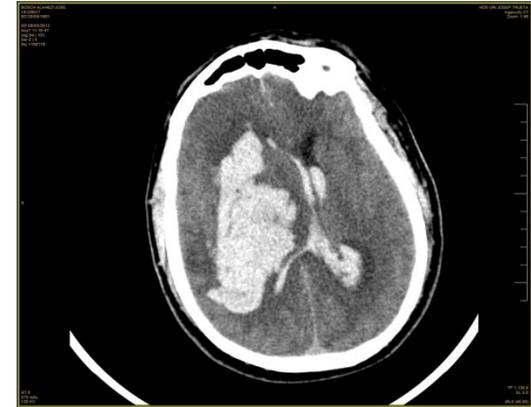


Focalidad neurológica catastrófica



Intubación OT

Urgencias
Exploración NRL



Neurólogo
Eco-doppler TC/ATC
No tributario TM/TQ

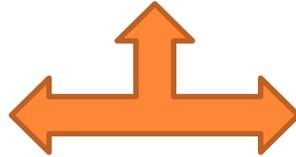
1. Presencia de prerrequisitos
2. Exploración NRL ME
3. Tests adicionales

Detección potencial donante

Aviso a CT



Focalidad neurológica catastrófica

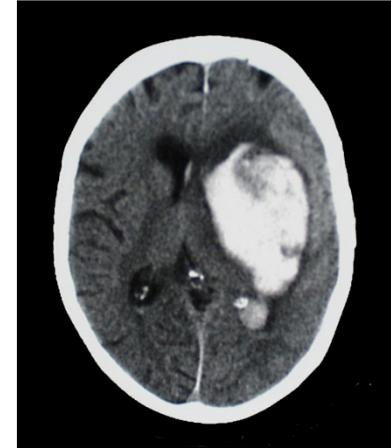


Urgencias
Exploración NRL

Neurólogo
Eco-doppler TC

Detección potencial donante

Aviso a CT

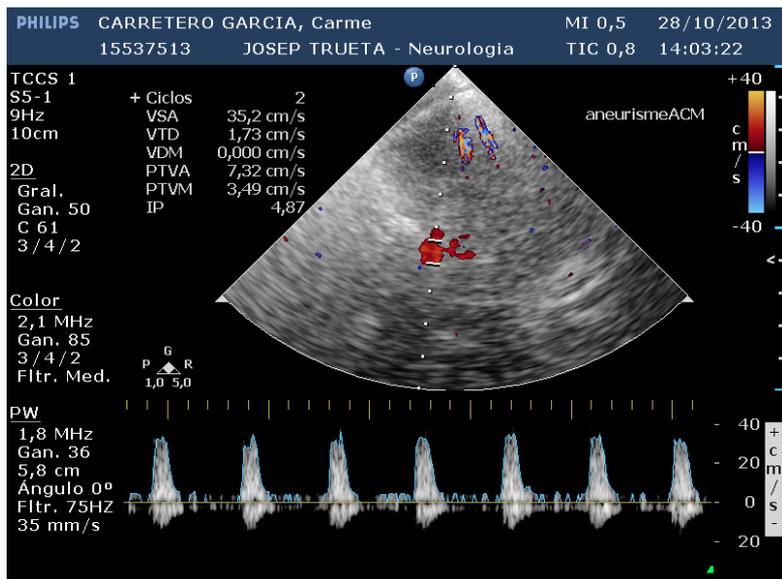


1. Presencia de prerrequisitos
2. Exploración NRL ME
3. Tests adicionales

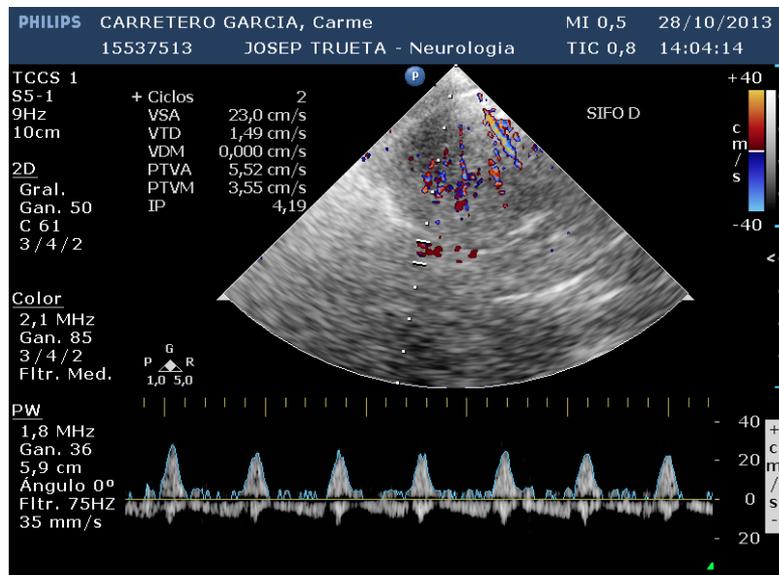


No ME

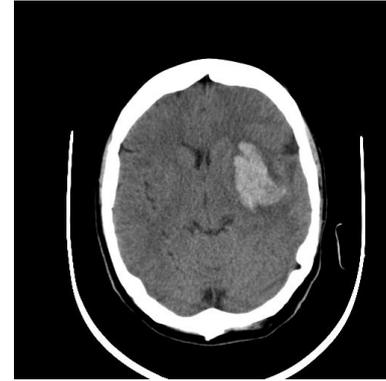
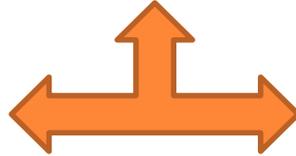




Patrón transicional...



Focalidad neurológica

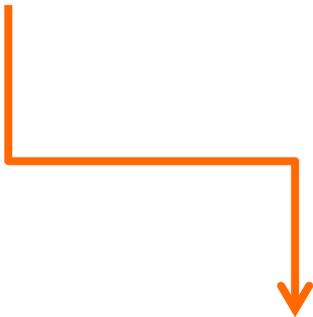
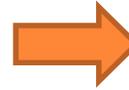
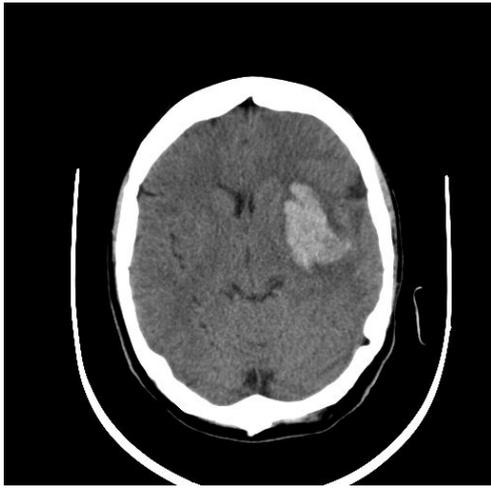


Urgencias
Exploración NRL

Neurólogo
Eco-doppler TC

Ingreso en Unidad de Ictus





Deterioro neurológico



**Es un potencial donante?
Aviso a CT**

- Muchos pacientes con pronóstico infausto no son identificados como posibles donantes
- Otros se deterioran entre el periodo de reconocimiento de ME y su diagnóstico definitivo
- En muchos pacientes se inician medidas de confort previo al reconocimiento como posibles donantes
- En algunos pacientes existe incertidumbre en cuanto al pronóstico
- En otros existe incertidumbre en cuanto a si acabarían con diagnóstico de ME
- A veces...tenemos poca disponibilidad de camas en unidades de críticos



- El reconocimiento como posible donante
- La realización de pruebas accesibles en urgencias como el eco-doppler TC
- Y la existencia de criterios pronósticos de ME puede facilitarnos el manejo de estos pacientes ...



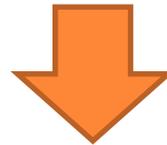
Con el objetivo de preservar los órganos, facilitar la donación e informar de forma más adecuada a las familias



○ Decisión de **irreversibilidad** 

1. Reconocimiento como posible donante

2. Acabará en muerte encefálica?



¿Tenemos predictores de ME?





Pacient de 61 anys. Esquizofrenia

EA: disminució nivell de consciència, disàrtria i hemiplègia E

SEM GCS 12

Exploració a urgències: TA 250/120

GCS 3 midriasi dreta arreactiva, Babinski bilateral



PREDICTORES A MUERTE ENCEFÁLICA

- Estudio multicéntrico retrospectivo en 2013 con pacientes con ictus isquémico y hemorrágico y HSA con decisión de no tratamiento por mal pronóstico para identificar factores pronósticos de ME
- Se incluyeron 400 pacientes, de los cuales 23% ME



- GCS ≤ 6 previo a sedación
- Volumen lesión > 65 ml
- Presencia de herniación y/o hidrocefali
- TAS > 150 mmHg
- Historia previa de abuso de alcohol

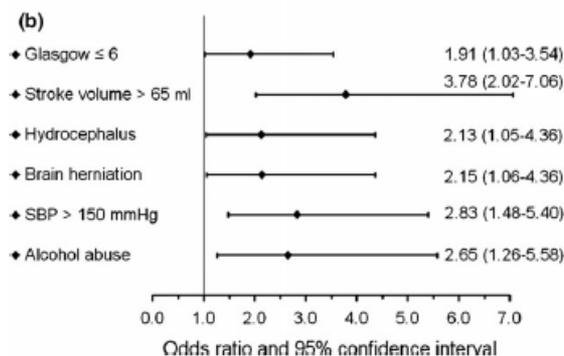
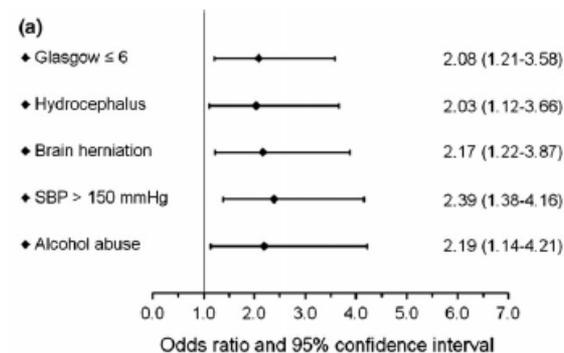


Table 3. Risk progression to brain death according to the number of predictive factors.

	Grade	Risk factors number	Interpretation	Events/patients	OR (95% CI)	P-value	Corrected c-index
Score 1	1	0-1 factor	–	11/129	Reference	–	72% (67–78%)
	2	2 factors	vs. 0–1 factor	17/109	1.98 (0.89–4.44)	0.096	
	3	3–5 factors	vs. 0–1 factor	59/139	7.91 (3.92–16.0)	<0.0001	
		Total	–	87/377	–	–	
Score 2	1	0-1 factor	–	3/85	Reference	–	77% (72–82%)
	2	2–3 factors	vs. 0–1 factor	24/140	5.66 (1.65–19.4)	0.006	
	3	4–6 factors	vs. 0–1 factor	48/95	27.9 (8.24–94.6)	<0.0001	
		Total	–	75/320	–	–	

Score 1: stroke-type independent (without stroke volume), score 2: stroke-type dependent (with stroke volume). OR (95% CI): odds ratio (95% confidence interval) and corrected c-index: bootstrap bias-corrected c-index (95% confidence interval).



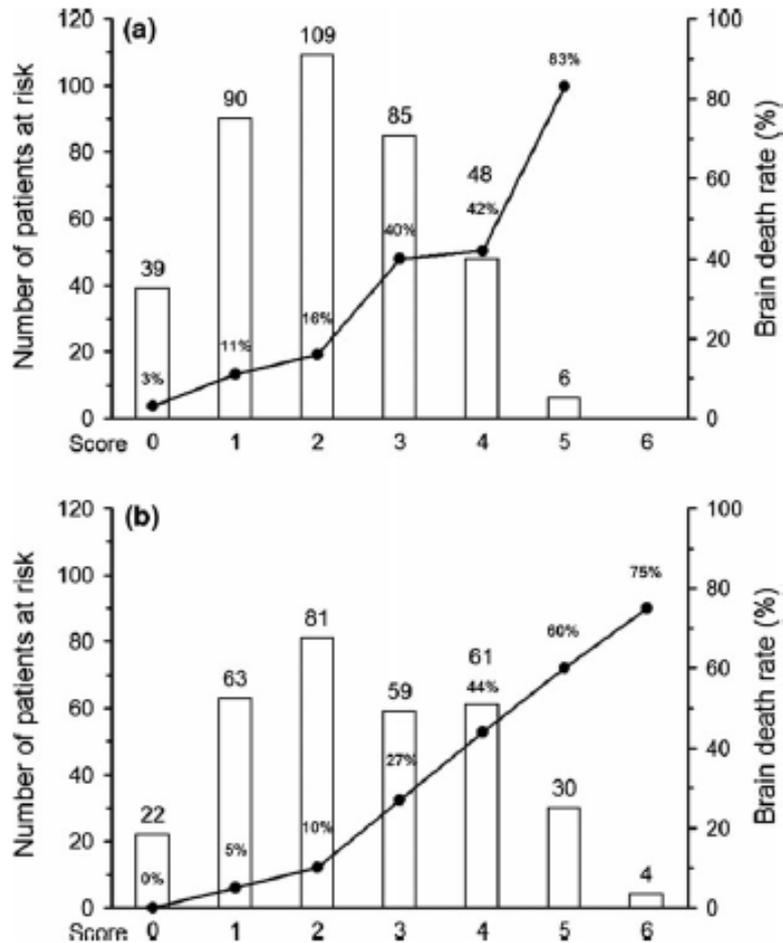


Figure 2 Number of patients at risk and the percentage of progression to brain death at each point of scores for model 1(a) and 2(b). Model 1: stroke-type independent (without stroke volume), model 2: stroke-type dependent (with stroke volume).

Predictive factors of brain death in stroke patients

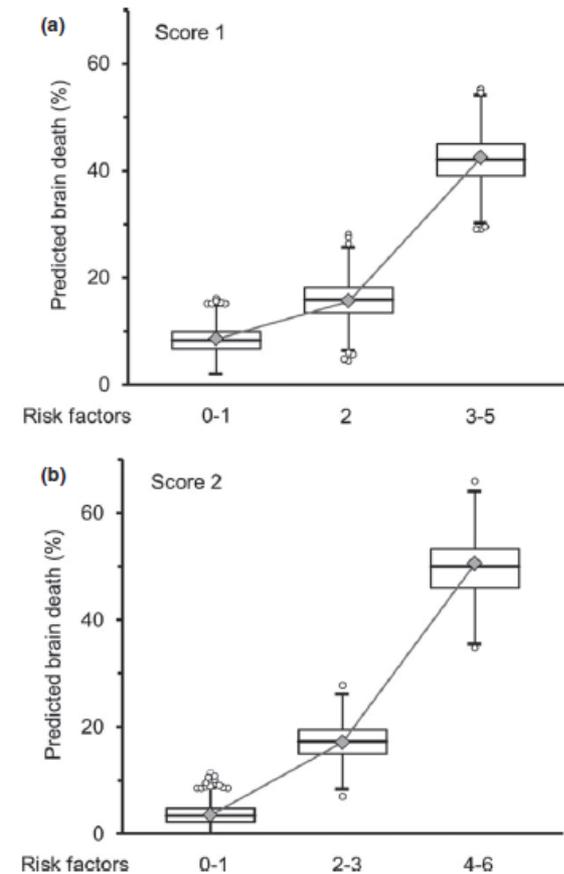


Figure 3 Predicted percentages of patients (Tukey's box and whiskers plots derived from internal validation) with brain death progression according to score for model 1(a) and 2(b). Model 1: stroke-type independent (without stroke volume), model 2: stroke-type dependent (with stroke volume), box limits: interquartile range (IQR), middle line: median, vertical lines: adjacent values (1st quartile - 1.5 IQR; 3rd quartile + 1.5 IQR), empty dots: outliers. Additional data: observed percentages of patients with progression to brain death (grey diamonds and corresponding curve).

- Estudio prospectivo multicéntrico de 2012 a 2014
- Criterios inclusión: pacientes con HIC ingresados en UCI < 48 h inicio y GCS≤8
- Objetivo: determinar factores predictivos a ME
- Resultados: 140 pacientes, 24 progresaron a ME



Severe Supratentorial Intracerebral Hemorrhage: Factors Related to Brain Death Development

J.J. Egea-Guerrero^{a,*}, A.M. Ferete-Araujo^a, A. Vilches-Arenas^b, M.D. Freire-Aragón^a, G. Rivera-Rubiales^a, M. Quintana-Díaz^c, D.A. Godoy^d, and F. Murillo-Cabezas^a



Table 1. Results From Univariate Analysis to Determine Each Variable's Predictive Ability for Brain Death Development After Spontaneous Supratentorial Intracerebral Hemorrhage

Variable	Brain Death		
	OR	95% CI	P
Age	1.047	1.002–1.093	.041
Arterial hypertension	3.684	1.036–13.104	.044
Anticoagulants	4.773	1.667–13.662	.004
APACHE II	1.124	1.033–1.224	.007
Photomotor alteration	4.400	1.760–10.999	.002
Glycaemia at admission (mg/dL)	1.007	1.000–1.013	.041
Intraventricular hemorrhage	1.14	1.016–20.476	.48
Hematoma volume [mL]	1.014	1.002–1.025	.020
Rebleeding	2.738	1.083–6.923	.033
No hematoma evacuation	5.579	1.947–15.983	.001
Acute and symptomatic hydrocephalus	2.879	1.006–8.238	.049

Abbreviations: APACHE, Acute Physiology And Chronic Health Evaluation; OR, odds ratio.



Table 1. Results From Univariate Analysis to Determine Each Variable's Predictive Ability for Brain Death Development After Spontaneous Supratentorial Intracerebral Hemorrhage

Variable	Brain Death		
	OR	95% CI	P
Age	1.047	1.002–1.093	.041
Arterial hypertension	3.684	1.036–13.104	.044
Anticoagulants	4.773	1.667–13.662	.004
APACHE II	1.124	1.033–1.224	.007
Photomotor alteration	4.400	1.760–10.999	.002
Glycaemia at admission (mg/dL)	1.007	1.000–1.013	.041
Intraventricular hemorrhage	1.14	1.016–20.476	.48
Hematoma volume [mL]	1.014	1.002–1.025	.020
Rebleeding	2.738	1.083–6.923	.033
No hematoma evacuation	5.579	1.947–15.983	.001
Acute and symptomatic hydrocephalus	2.879	1.006–8.238	.049

Abbreviations: APACHE, Acute Physiology And Chronic Health Evaluation; OR, odds ratio.

Anàlisi multivariant



Prediction of evolution toward brain death upon admission to ICU in comatose patients with spontaneous intracerebral hemorrhage using simple signs

- Estudio multicéntrico retrospectivo 72 pacientes con HIC +ventilación mecánica

Objetivo: identificar predictores a ME en pacientes comatosos por HIC, a su ingreso en UCI

- 49% ME, 39% éxitus post retirada TSV, 12% vivos

Table 2. Two models to predict upon admission evolution toward brain death.

Variable	Crude odds ratio	Adjusted odds ratio	P-value
Model 1			
Number of abolished brainstem responses ≥ 3	12.3 (3.8, 39.6)	8.4 (2.4, 29.1)	<0.0001
The swirl sign	7.8 (2.7, 22.3)	5.0 (1.6, 15.9)	0.006
Model 2			
Abolition of corneal reflexes			0.002
Unilateral	3.9 (0.9, 16.3)	4.2 (0.9, 20.1)	
Bilateral	11.4 (3.4, 37.9)	8.8 (2.4, 32.3)	
The swirl sign	7.8 (2.7, 22.3)	6.2 (1.9, 20.0)	<0.0001



Table 3. Two scores predicting evolution toward brain death.

Value of the score	Score 1*			Score 2†		
	0	1	2	0-1	2	3-4
Number of patients, <i>n</i>	29	22	21	28	20	24
Evolution to brain death, <i>n</i> (%)	4 (14)	13 (59)	18 (86)	4 (14)	11 (55)	20 (83)
Threshold	≥ 1			≥ 2		
Sensitivity	0.89			0.88		
Specificity	0.68			0.65		
Positive predictive value	0.72			0.70		
Negative predictive value	0.86			0.86		

*The score 1 was calculated by attributing one point for ≥ 3 abolished brain stem responses upon admission to the ICU and one point for the swirl sign on the first CT scan.

†The score 2 was calculated by attributing one point for unilateral abolition of corneal reflexes, two points for bilateral abolition of corneal reflexes upon admission to the ICU and two points for the swirl sign on the first CT scan.

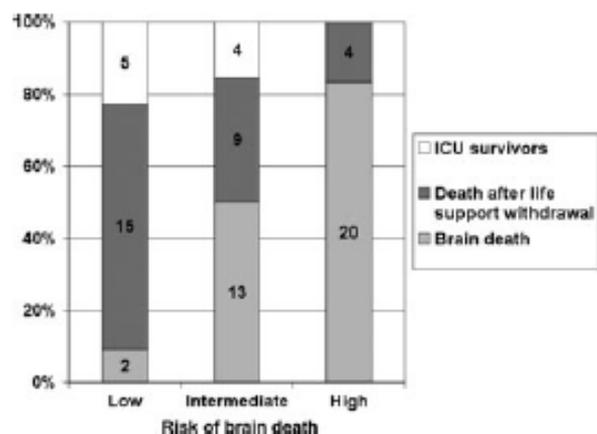


Figure 2 Classification of risk of BD in three groups, as derived from Model 2. The three groups were defined as follow: low risk (no corneal reflexes abolition at ICU admission and the swirl sign on the first CT scan), high risk (at least one corneal reflex abolished at ICU admission and the swirl sign on the first CT scan), and intermediate risk of ICH (the other patients).

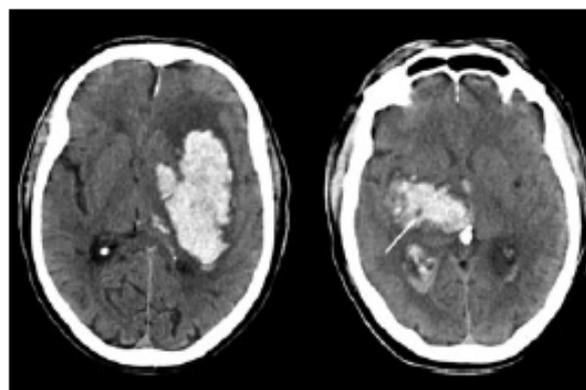


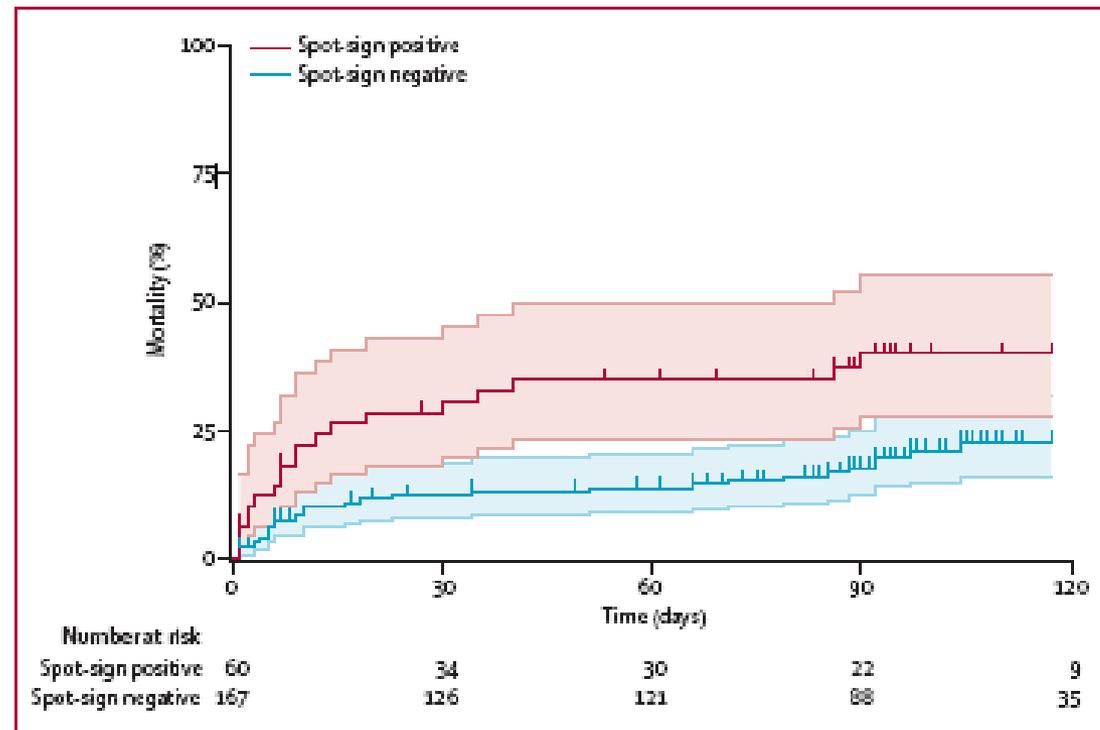
Figure 3 Examples of baseline unenhanced CT scans. Left: intracerebral hemorrhage without swirl sign. Right: the swirl sign represents actively extravasating undotted fresh blood (arrow) which is of lower attenuation than clotted blood (typically 50–70 HU) which surrounds it. It represents active bleeding in the hematoma.



- El “swirl sign” fue la variable más predictiva de ME en TC inicial
- La abolición de los reflejos corneales al ingreso, la variable clínica más predictiva de ME
- El score incluyendo abolición corneal+SS predijo ME con sensibilidad 88% y especificidad 60% en pacientes con fármacos sedantes y una sensibilidad del 91% y especificidad del 70% sin sedantes



La presencia de “spot sign” en angio-TC es el radiomarcador más utilizado para predicción del crecimiento del hematoma y mal pronóstico de los pacientes con HIC pero no está estudiada su capacidad predictiva a ME



Demchuk et al. Lancet Neurology 2012



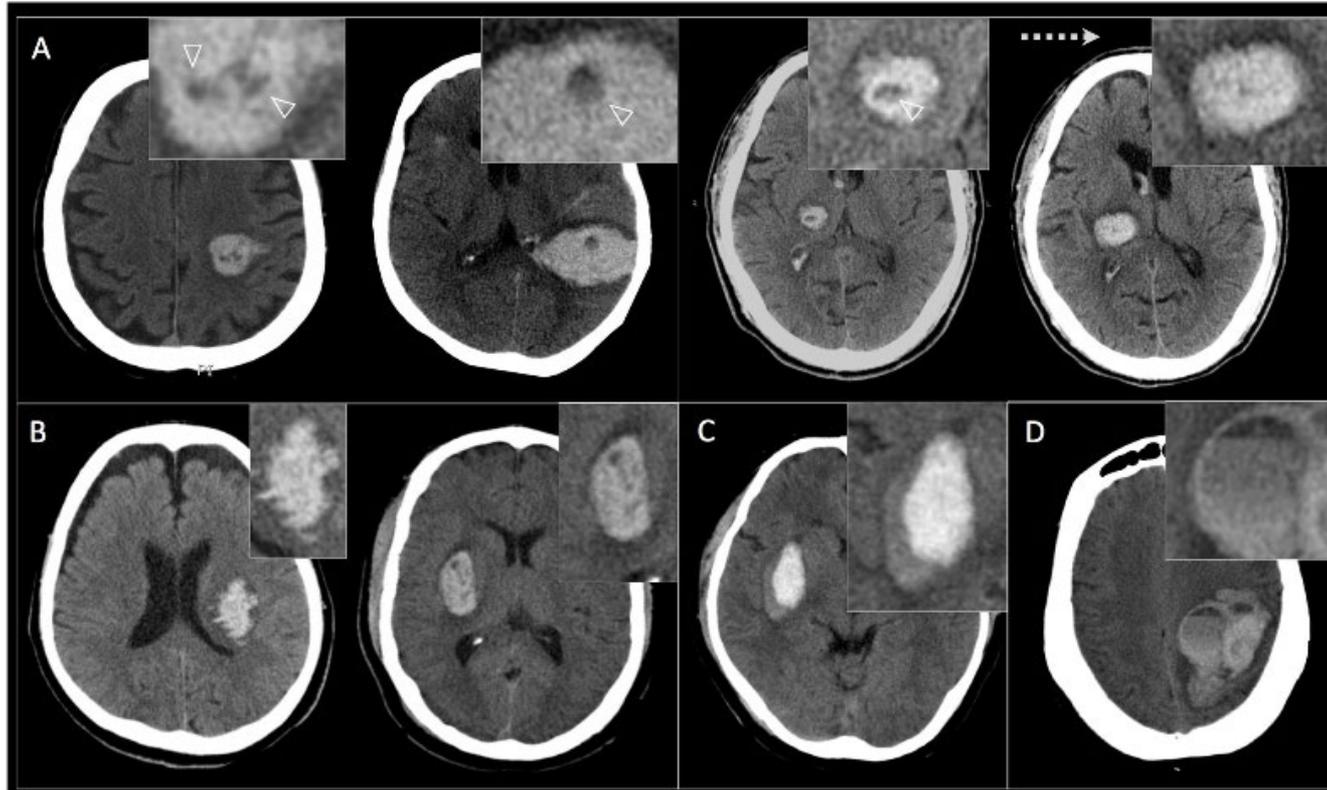
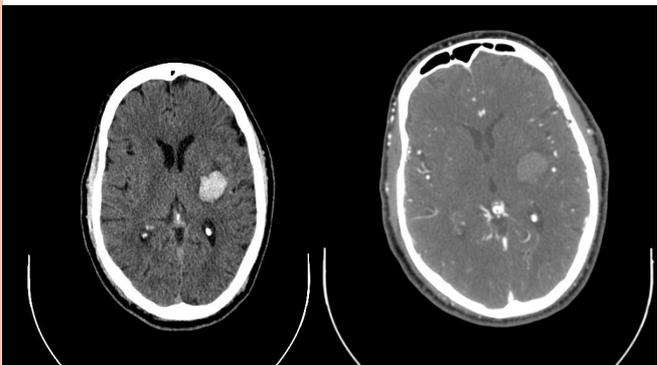


Figure 1. Examples of reported NCCT markers of hemorrhage-expansion

Axial slices of acute Non-contrast-CTs in ICH. (A) Hypodensities including from left to right, a swirl sign, a black-hole sign and a central hypodensity in an ICH demonstrating significant expansion on repeated CT after 8h. (B) ICH with irregular margins and ICH with heterogeneous density (also qualifying for “hypodensities” and “swirl sign”). (C) Blend sign (D) Fluid level.

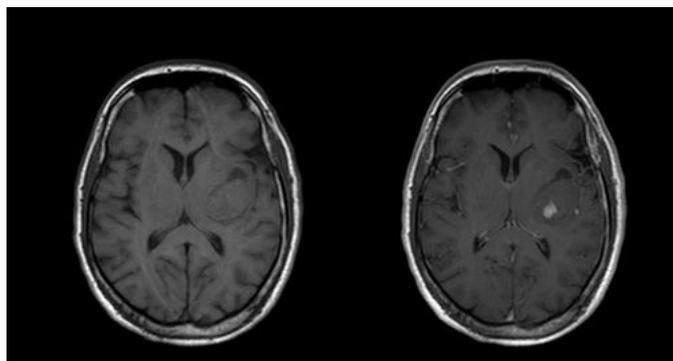


CASO 1



TC basal

ATC



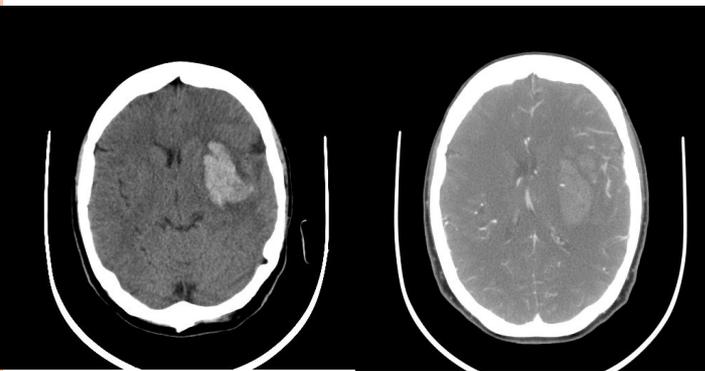
RM T1 basal

T1 postC



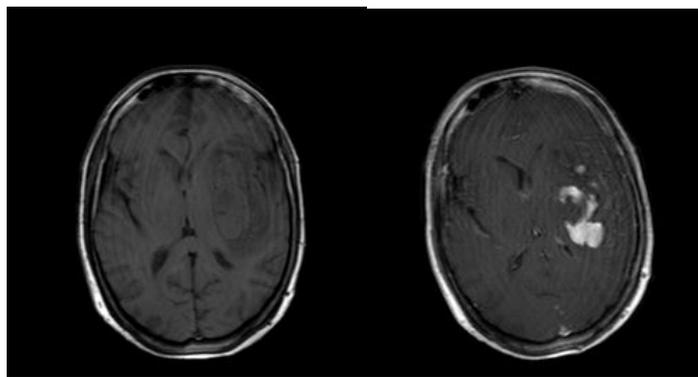
TC 72 h

CASO 2



TC basal

ATC

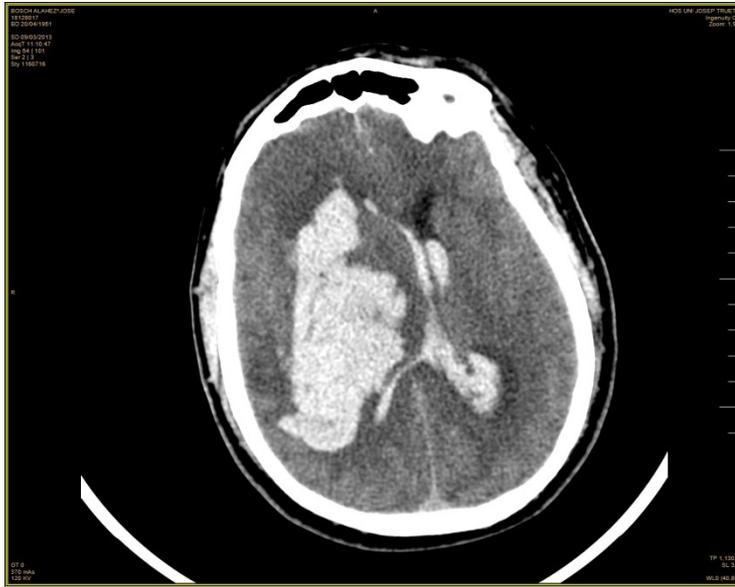


RM T1 basal

T1 postC



TC 72 h



Volumen HIC >60 cc
GCS < 6
Invasión ventricular
Herniación cerebral
Swirl sign (spot sign)
Hipertensión arterial
Alteraciones pupilares
Abolición reflejos corneales?

SCORE????

Paciente de 61 años. Esquizofrenia

EA: disminución nivel de conciencia, disartria y hemiplegia Izq

SEM GCS 12

Exploración en urgencias: TA 250/120

GCS 3 midriasis derecha arreactiva, Babinski bilateral

