LII

#SENR2024

Reunión Anual

SOCIEDAD ESPAÑOLA DE NEURORRADIOLOGÍA

7 - 9 de noviembre de 2024 • SAN SEBASTIÁN

SEDE: Hotel Barceló Costa Vasca

TÉCNICAS QUIRÚRGICAS ACTUALES Y FUTURAS EN EL TRATAMIENTO DE LA HEMORRAGIA INTRACRANEAL

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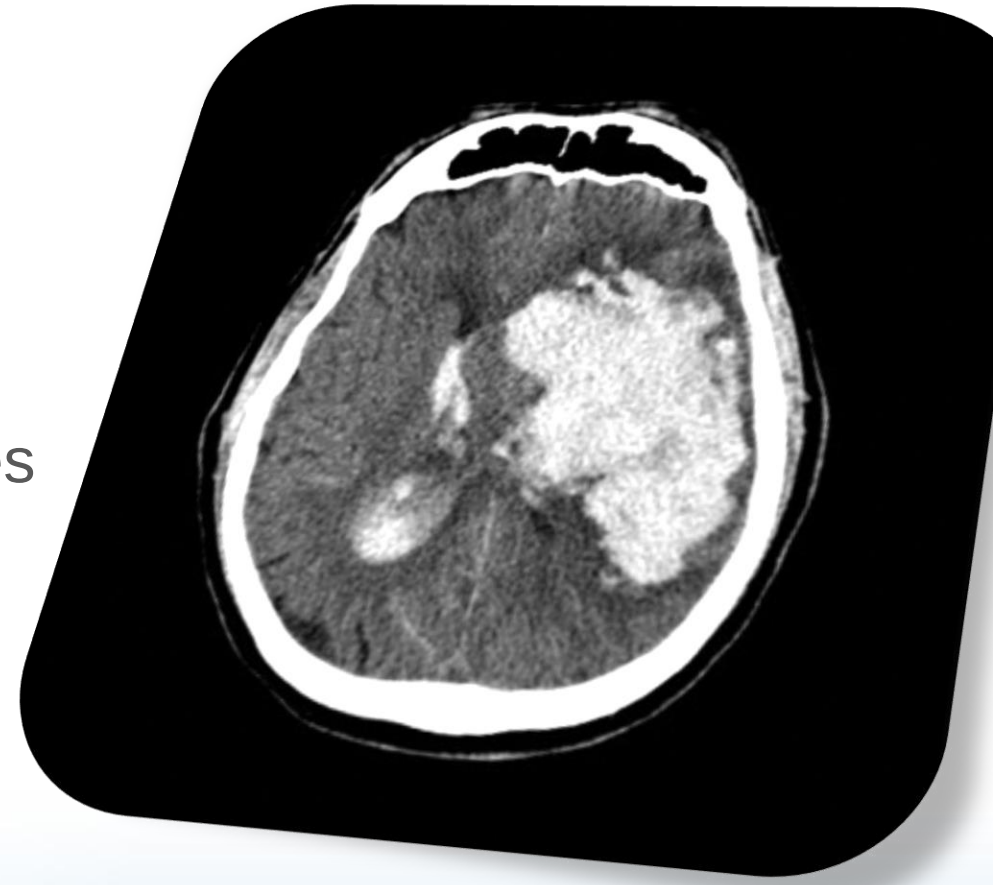
S.E.N.R
Sociedad Española de Neurorradiología

Hemorragia intracerebral espontánea



- 6,5-19,6% de los accidentes cerebrovasculares
- Alta tasa de mortalidad y morbilidad:
  - Mortalidad a los 30 días: 35-52%
  - Solo el 20% logran plena autonomía
- HIV 50-80% mortalidad

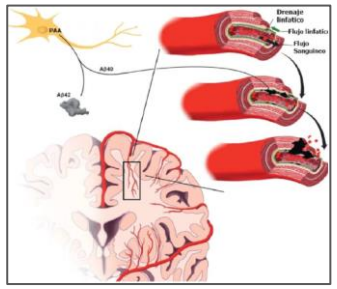
Hemorragia intracerebral espontánea

- Afecta a 2 millones de personas cada año
- Incidencia en aumento:
  - envejecimiento de la población
  - uso de anticoagulantes y antiagregantes
- Adultos en edad laboral:
  - impacto social y económico
  - Gran pérdida de años de vida productiva

Uno de los problemas de salud pública más grave

Hemorragia intracerebral espontánea
Factores de riesgo

- Hipertensión arterial
  - 50-70% de las HIC
  - Menor incidencia por mejor control de HTA
- Anticoagulantes
  - Hemorragias más graves
  - Mayor incidencia en última década
- Angiopatía amiloidea
  - >60 años
  - 12-15% de las HIC lobares
  - Menor mortalidad. Mayor recurrencia



Tratamiento de la HIC:

- ESTABILIZACIÓN DEL PACIENTE
  - Monitorización de constantes vitales
  - Tratamiento antihipertensivo +/- anticonvulsivante
  - Corrección de coagulopatías
- **¿CIRUGÍA?**
- REHABILITACIÓN

Daño Cerebral Primario
"Mecánico"

Efecto de masa

Aumento PIC
Disminución
FSC

Compresión del
parénquima

Herniación
Inflamación

EDEMA CITOTÓXICO

Sobreexpresión canales
SUR1-TRPM4

Daño cerebral Secundario
"Químico"

Productos degradación
sangre

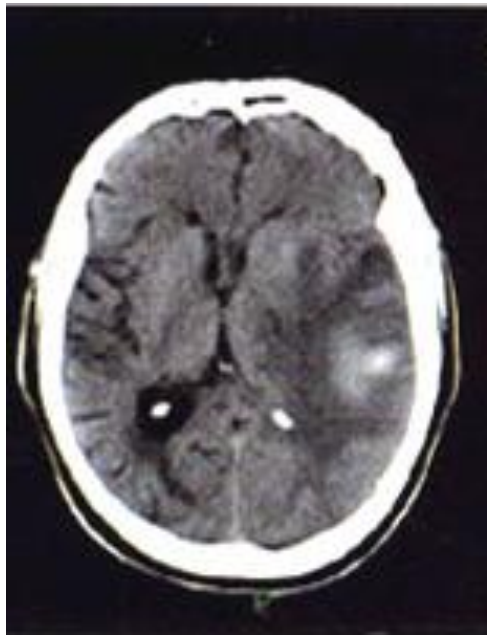
Inflamación daño mecánico

Estrés oxidativo, microglía,
citoquinas, céls inmunitarias

Alteración BHE

EDEMA VASOGÉNICO

Disfunción "Tight-Junctions"
cels endoteliales



VOLUMEN HEMATOMA

VOLUMEN EDEMA

Tratamiento quirúrgico de la HIC:

FUNDAMENTO MECÁNICO:

- Reducir efecto de masa
- Mejorar presión intracraneal y perfusión cerebral
- Evitar herniaciones

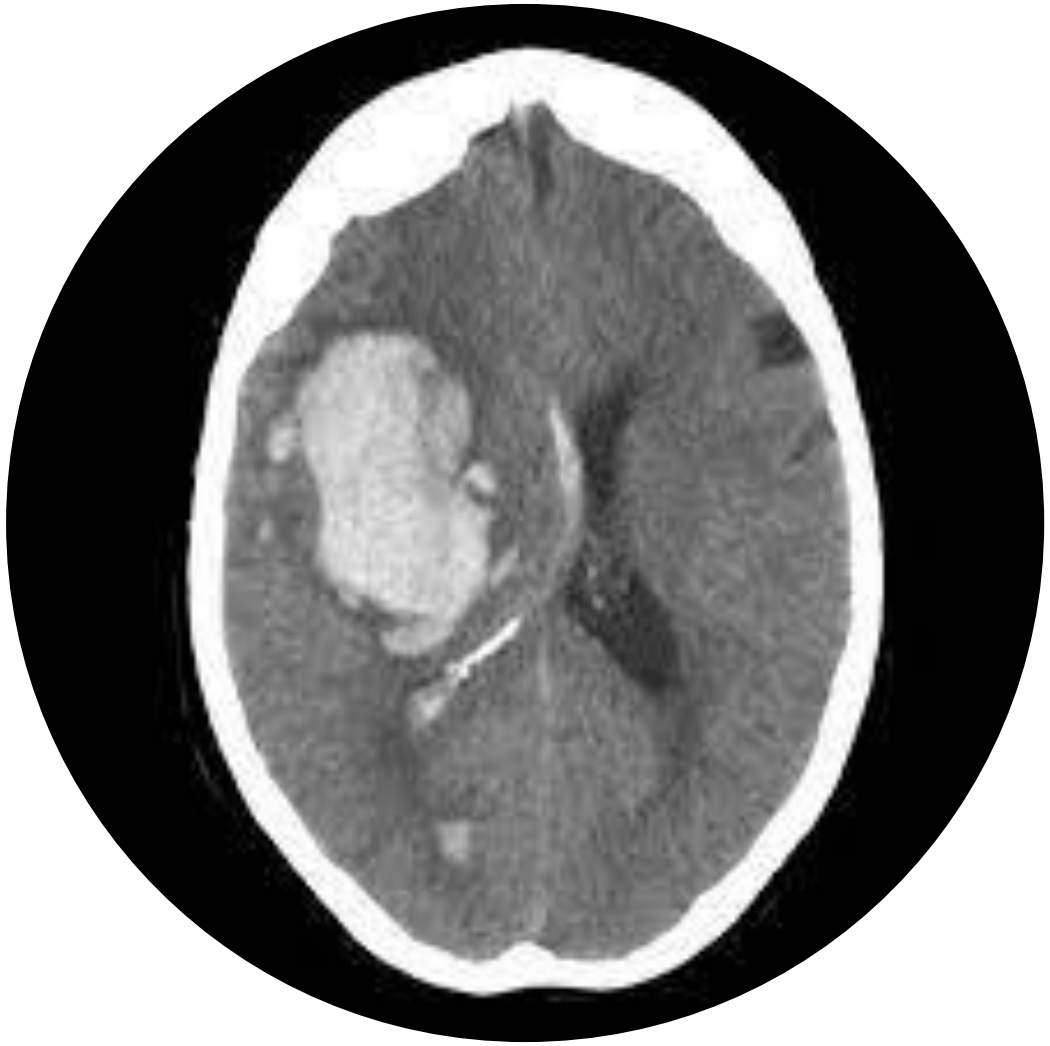
FUNDAMENTO QUÍMICO:

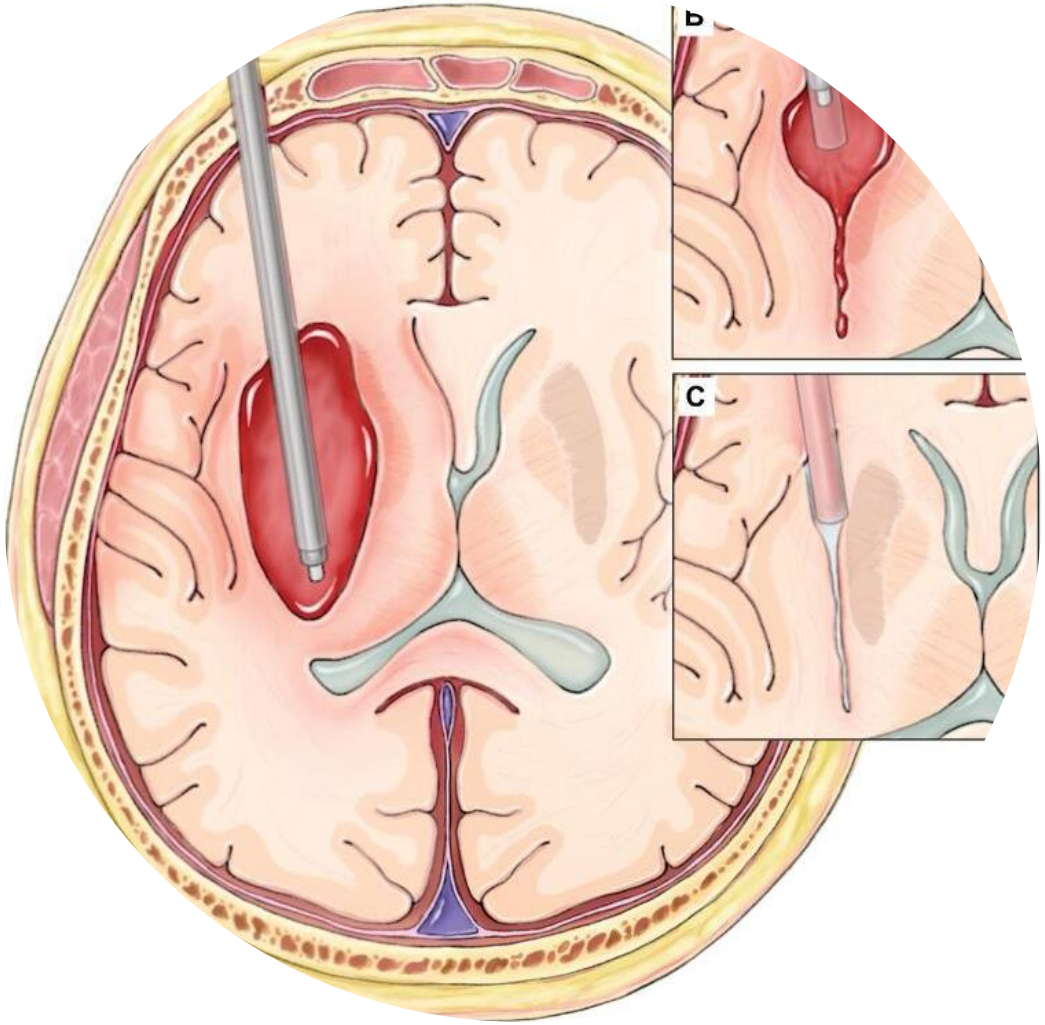
- Reducir el daño secundario (cambios químicos debidos a los productos de degradación de la sangre)

Tratamiento quirúrgico de la HIC:

CONTRAS O LIMITACIONES:

- Cirugía Mayor. Anestesia general
- Atravesar tejido cerebral viable para acceder al hematoma
- Riesgo de complicaciones quirúrgicas

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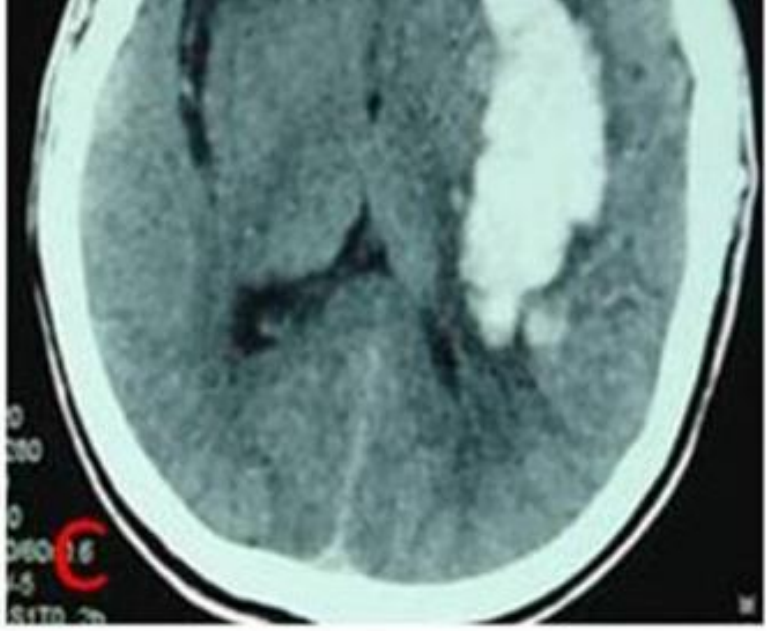
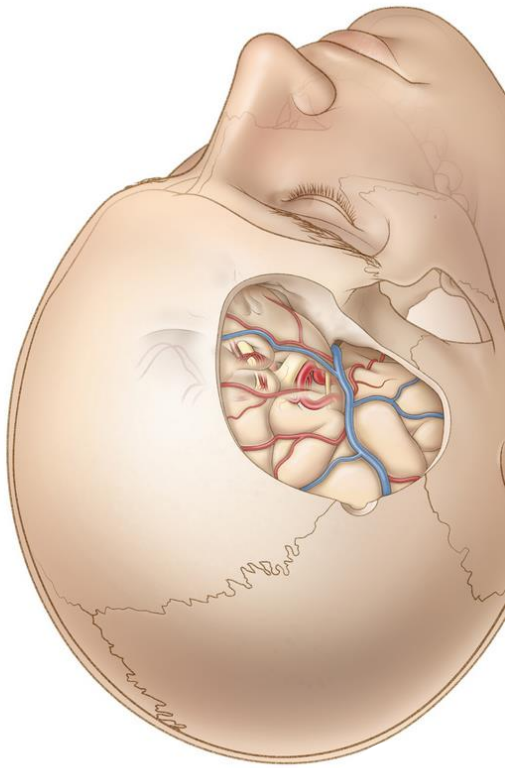
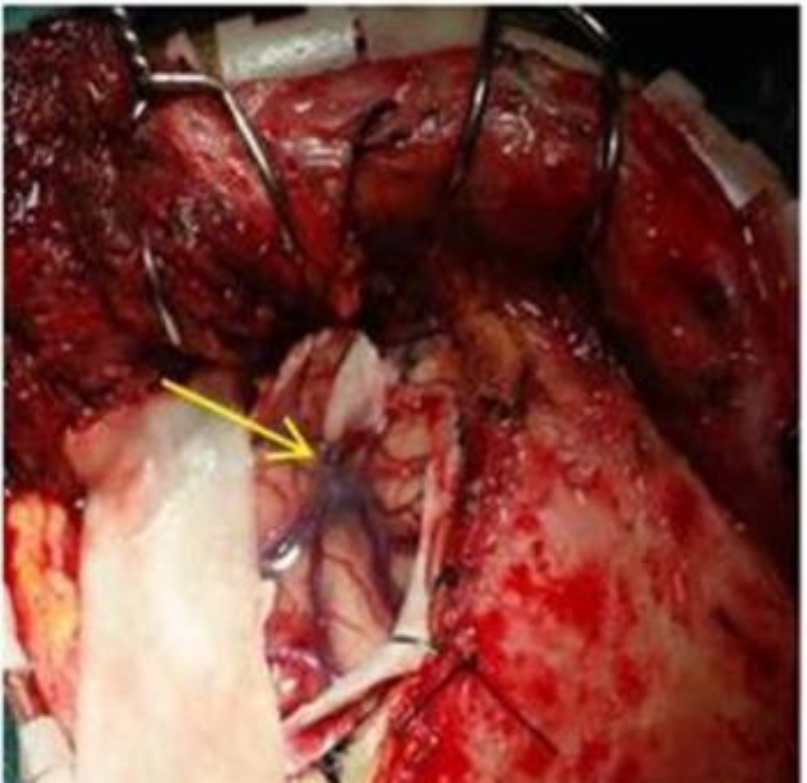
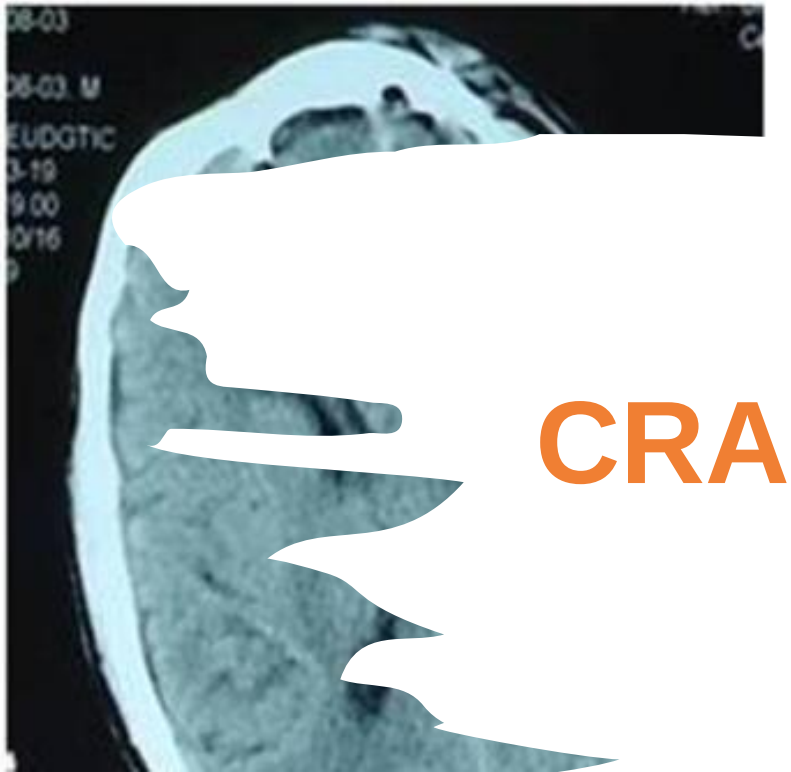
Cirugía de la hemorragia intracerebral:

¿De dónde venimos y hacia dónde vamos?









CRANEOTOMÍA

Early surgery versus initial conservative treatment in patients with spontaneous supratentorial intracerebral haematomas in the International Surgical Trial in Intracerebral Haemorrhage (STICH): a randomised trial

A David Mendelow, Barbara A Gregson, Helen M Fernandes, Gordon D Murray, Graham M Teasdale, D Ter
*M Donald M Shaw, and David H Barer for the STICH investigators**

- No diferencias significativas en cuanto a buen pronóstico ni mortalidad en ambos grupos.
- Pacientes con hematomas superficiales podrían beneficiarse de una cirugía (¿nuevos ensayos?).

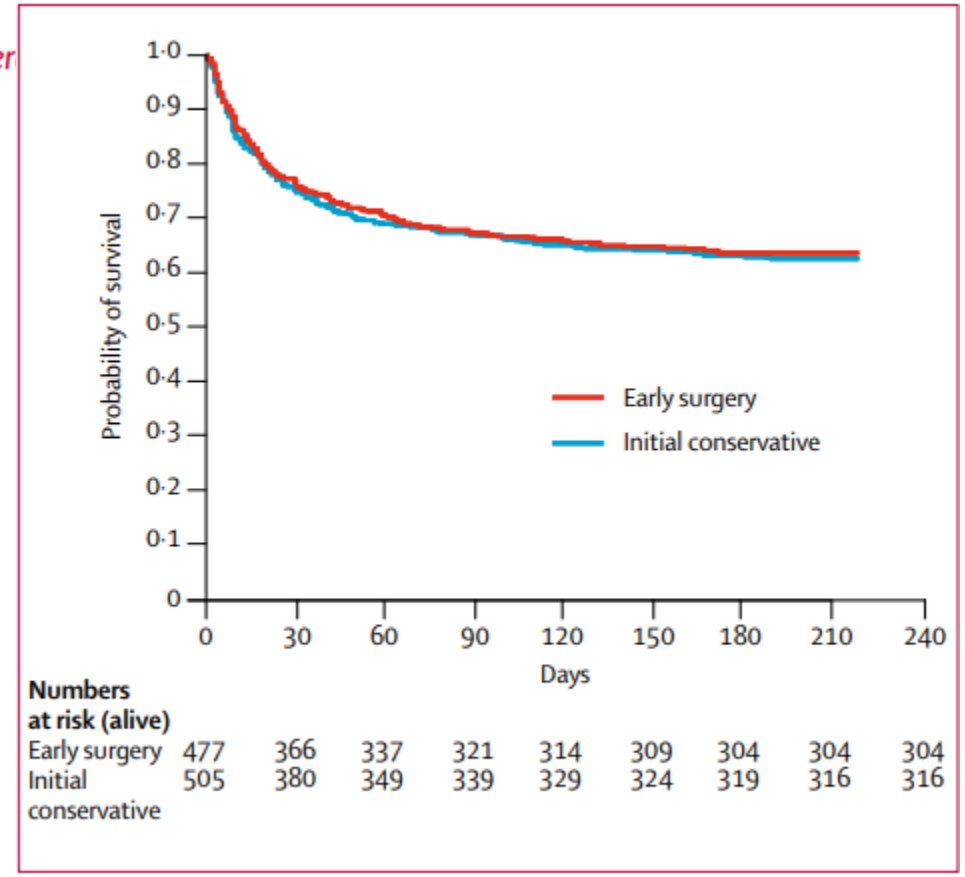


Figure 2: **Kaplan-Meier survival curves**

Early surgery versus initial conservative treatment in patients with spontaneous supratentorial lobar intracerebral haematomas (STICH II): a randomised trial

A David Mendelow, Barbara A Gregson, Elise N Rowan, Gordon D Murray, Anil Gholkar, Patrick M Mitchell, for the STICH II Investigators

Lancet 2013; 382: 397–408
Published Online
May 29, 2013
.org/10.1016/
13)60986-1

- La cirugía precoz no aumenta la mortalidad ni la discapacidad a los 6 meses
- Puede tener una mejor supervivencia
- Técnicas con menor invasión podrían ser beneficiosas en hemorragias profundas o intraventriculares (¿nuevos ensayos?)

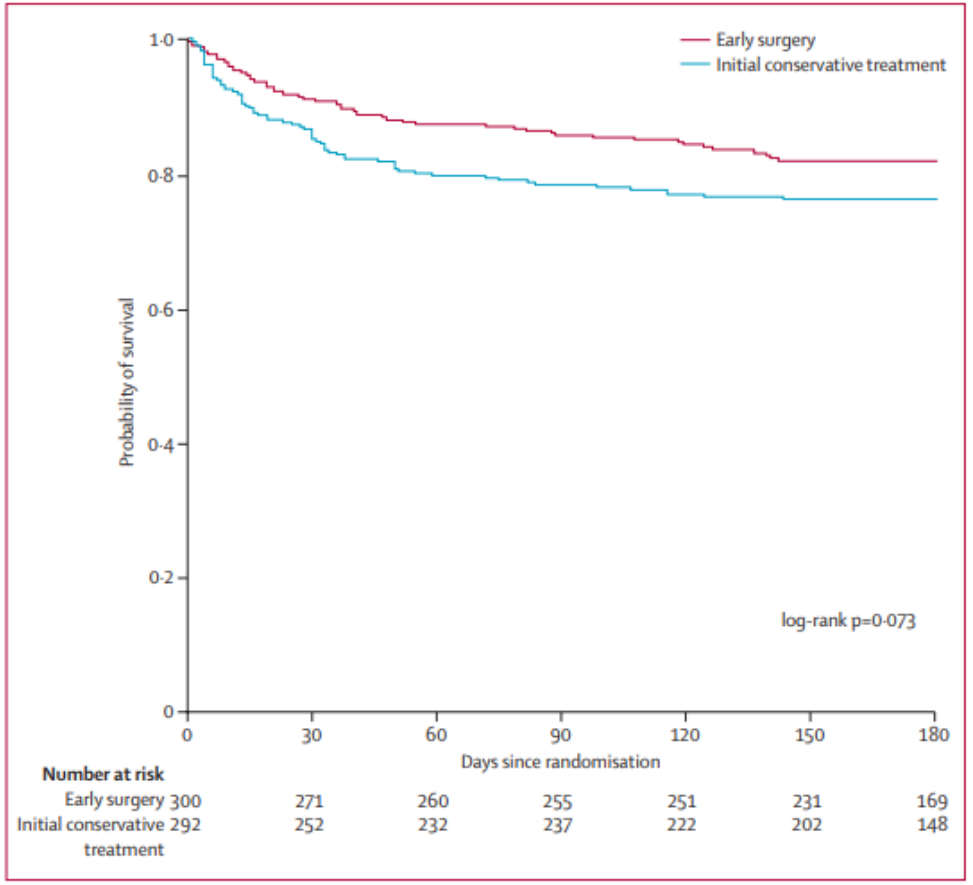


Figure 2: **Kaplan–Meier survival curve**

Surgery for Intracerebral Hemorrhage
Moving Forward or Making Circles?

Matthew L. Flaherty, MD; Jürgen Beck, MD

Stroke **October 2013**

So, have these efforts led us forward or simply back to our starting point? We think the field is moving forward. As with research efforts for ischemic stroke and subarachnoid hemorrhage, progress in treating ICH will consist of incremental gains; we should expect single base hits rather than home runs and a few strikeouts along the way. Conducting large stroke trials is difficult, especially for ICH. STICH II refines our knowledge of craniotomy and its role in the treatment of ICH. The STICH investigators are to be congratulated for their efforts and the information they have provided us. Now is the time to test new approaches.


¿CIRUGÍA MIS?

CIRUGÍA MÍNIMAMENTE INVASIVA (MIS) EN LA HIC

- Comienzo de las técnicas MIS en la década de los 60.

  Barnes B, Hanley DF, Carhuapoma JR. Minimally invasive surgery for intracerebral haemorrhage. Curr Opin Crit Care. (2014)

- Uso del endoscopio para evacuación de hematomas

  Backlund E-O, von Holst H. Controlled subtotal evacuation of intracerebral haematomas by stereotactic technique. Surg Neurol. (1978)

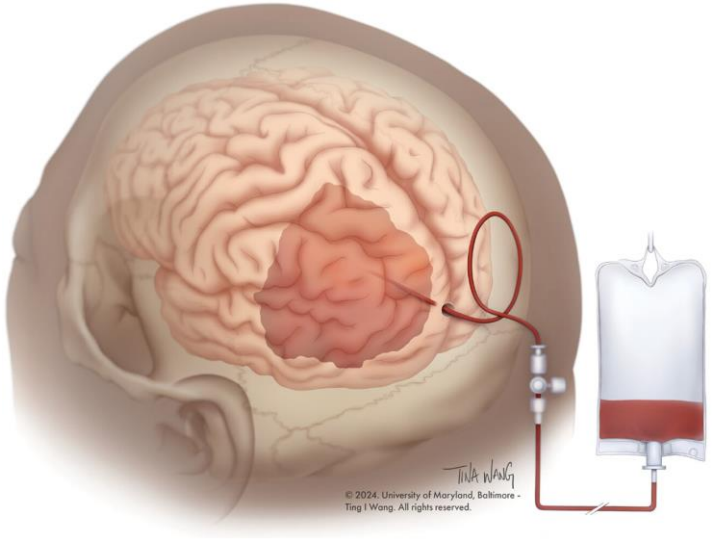
- Trombolisis mecánica mediante técnicas de ultrasonido en los 80.

  Hondo H, Uno M, Sasaki K, Ebisudani D, Shichijo F, Tóth Z, et al. Computed tomography controlled aspiration surgery for hypertensive intracerebral hemorrhage. Stereotact Funct Neurosurg. (1990)

TÉCNICAS MIS EN LA HIC

TÉCNICAS FARMACOLÓGICAS (catéter)

- Catéter estereotáctico + trombolítico (pasiva)
- Sencillo / Bedside
- Lento: hasta 8 días
- Bajas tasas de evacuación



TÉCNICAS MECÁNICAS

- Evacuación mecánica (activa)
- Más complejo / infraestructura
- En un solo tiempo
- Permite coagular vasos sangrantes
- Altas tasas de evacuación

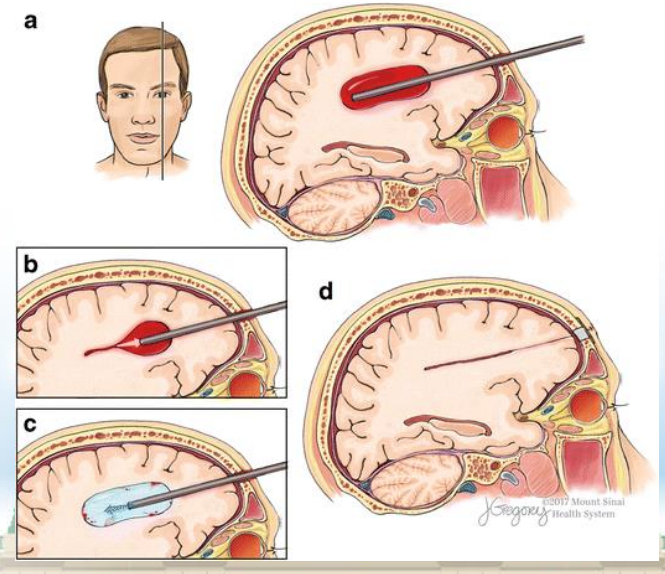


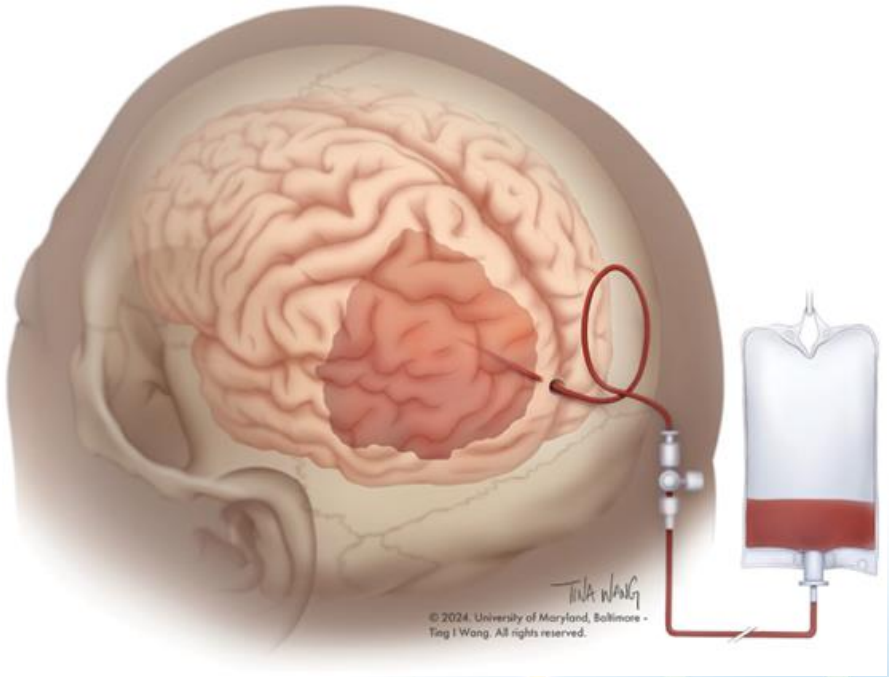
TABLE 1 | Randomized controlled trials of MIS for ICH and IVH.

References	Treatment		Included patients (MG/OG)	Age* (years) (MG/OG)	Hematoma location	Volume* (ml) (MG/OG)	Onset to surgery (hours)	Outcomes	Follow-up (months)
	MG	OG							
Auer et al. (18)	ES	CMT	100 (50/50)	30–80	Subcortical, putaminal, or thalamic	≥10	Within 48	①②③	6
Naff et al. (19)	EVD with urokinase	EVD with saline	12 (7/5)	49.6/55.2	IVH with or without supratentorial ICH	ICH: 5.3/13.2 IVH: 72.8/41.54	NA	②③④⑤	1
Teernstra et al. (20)	SA with urokinase	CMT	71 (36/35)	67/69	Supratentorial	66/52	Within 72	①②	6
Zhang et al. (21)	ES with EVD	EVD with urokinase	42 (20/22)	31-75	IVH with or without Supratentorial ICH	ICH < 30	Within 48	①②	2
Kim and Kim (22)	SA	CMT	387 (204/183)	64.3/67.1	Basal ganglia and thalamus	24.3/21.0	NA	①②③	6
Wang et al. (23)	CP with urokinase	CMT	377 (195/182)	56.6/56.9	Basal ganglion	33.9/31.3	4–72	①②③	3
Chen et al. (24)	ES with EVD	EVD	48 (24/24)	65.54/62.17	IVH with thalamic hemorrhage	ICH:10.5/11.5	NA	①②⑤	3
Sun et al. (25)	CP with urokinase	CC with small bone flap	304 (159/145)	56.9/55.2	Basal ganglion	52.3/51.7	Within 72	①②③	3
Naff et al. (26)	EVD with rt-PA	EVD with placebo	48 (26/22)	54.1/56.6	IVH with or without supratentorial ICH	ICH: 7.2/7.9 IVH:54.8/50.1	≤12	②③④	1
Zhou et al. (27)	CP with urokinase	CC with large bone flap	168 (90/78)	57.6/59.2	Basal ganglion or brain lobe	30–100 ml	6–24	①②③	12
Hanley et al. (28)	SA with rt-PA	CMT	96 (54/42)	60.7/61.1	Lobar or deep	48.2/43.1	NA	①②③	12
Vespa et al. (29)	ES	CMT	24	59/62	Supratentorial	36.4/41.4	Within 48	①②③	12
Hanley et al. (30)	EVD with rt-PA	EVD with saline	500 (249/251)	59/59	IVH with or without supratentorial ICH	ICH:8.3/7.2 IVH:21.2/22.4	≤12	①②③④⑤	6
Hanley et al. (31)	SA with rt-PA	CMT	506 (255/251)	62/62	Basal ganglia or lobar region	42.7/41.5	NA	①②③	12

CC, conventional craniotomy; CMT, conservative medical treatment; CP, craniopuncture; ES, endoscopic surgery; EVD, external ventricular drainage; ICH, intracerebral hemorrhage; IVH, intraventricular hemorrhage; MG, minimally invasive surgery group; NA, not available; OG, other treatment options group; SA, stereotactic aspiration. ① good functional outcome; ② death; ③ rehemorrhage; ④ ventriculitis; ⑤ ventriculoperitoneal shunt.
**Age and volume are usually expressed as mean or median. If there was no such information in literatures, a range would be given.*

Minimally Invasive Surgery for Intracerebral and Intraventricular Hemorrhage.
Zheng Z, et al. Front Neurol. 2022. PMID: 35273553

Técnicas MIS farmacológicas (pasivas)



MIS basadas en catéter farmacológico:
YL-1 Craniopuncture

Randomized Controlled Trial > Int J Stroke. 2009 Feb;4(1):11-6.
doi: 10.1111/j.1747-4949.2009.00239.x.

Minimally invasive craniopuncture therapy vs. conservative treatment for spontaneous intracerebral hemorrhage: results fr clinical trial in China

Wen-Zhi Wang [1], Bin Jiang, Hong-Mei Liu, Di Li, Chuan-Zhen Lu, Ya-
Affiliations + expand
PMID: 19236490 DOI: 10.1111/j.1747-4949.2009.00239.x

Aguja rígida y afilada:
Riesgo de resangrado y mayor daño cerebral

- Ensayo randomizado multicéntrico
- 377 pacientes con hematomas en ganglios basales de 25-40 ml.
- ón estereotáctica y aspirado guja YL-1 + infusión con **nasa** vs tto conservador.

- No diferencias en mortalidad entre ambos grupos
- Significativa reducción en dependencia al tercer mes en el grupo MIS (40,88 vs 63,3)

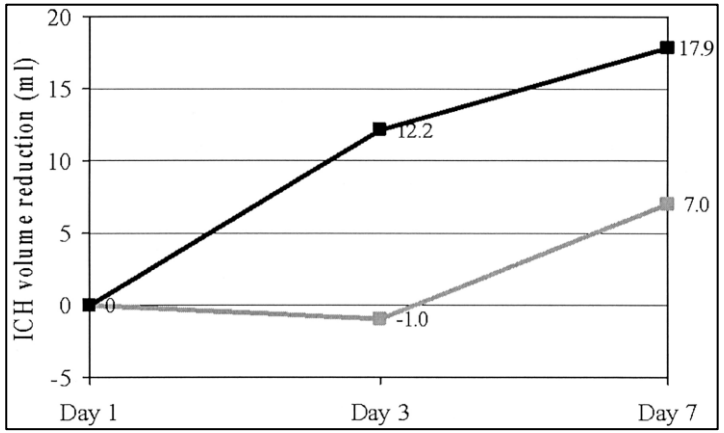
MIS basadas en catéter farmacológico:
Tratamiento estereotáctico intracerebral mediante un activador del plasminógeno (SICHPA)

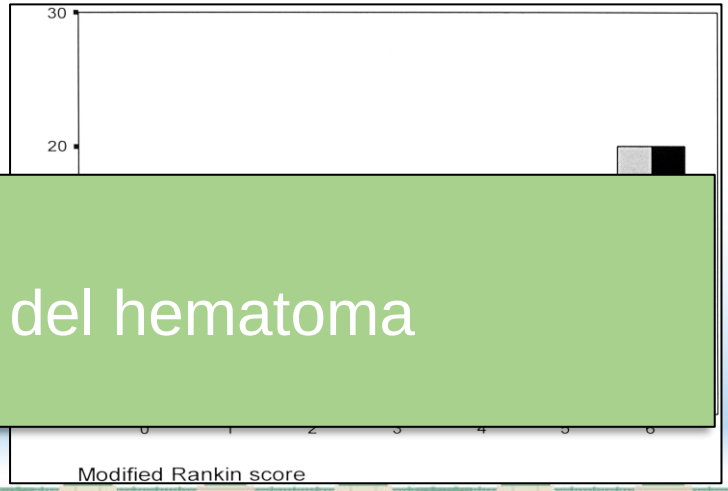
RESEARCH ARTICLE | Originally Published 20 March 2003 | Check for updates

Stereotactic Treatment of Intracerebral Hematoma by Means of a Plasminogen Activator: A Multicenter Randomized Controlled Trial (SICHPA)

O.P.M. Teernstra, MD, S.M.A.A. Evers, PhD, J. Lodder, MD, P. Leffers, MSc, C.L. Franke, MD, and G. Blaauw, MD | AUTHOR INFO & AFFILIATIONS

Stroke • Volume 34, Number 4 • https://doi.org/10.1161/01.STR.0000063367.52044.40





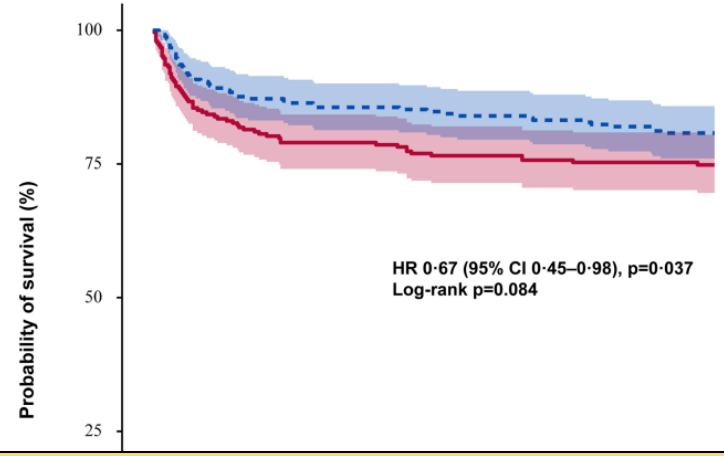
- Ensayo randomizado multicéntrico
- No diferencias en morbilidad ni mortalidad
- Técnica segura y efectiva para reducir el volumen del hematoma

MIS basadas en catéter farmacológico: Minimally invaive Surgery Plus recombinant Tissue Plasminogen Activator in Intracerebral Hemorrhage Evacuation (MISTIE I-III)

Clinical Trial > Lancet. 2019 Mar 9;393(10175):1021-1032. doi: 10.1016/S0140-6736(19)30195-3. Epub 2019 Feb 7.

Efficacy and safety of minimally invasive surgery with thrombolysis in intracerebral haemorrhage evacuation (MISTIE III): a randomised, controlled, open-label, blinded endpoint phase 3 trial

Daniel F Hanley [1], Richard E Thompson [2], Michael Rosenblum [2], Gayane Yenokyan [2], Karen Lane [3],



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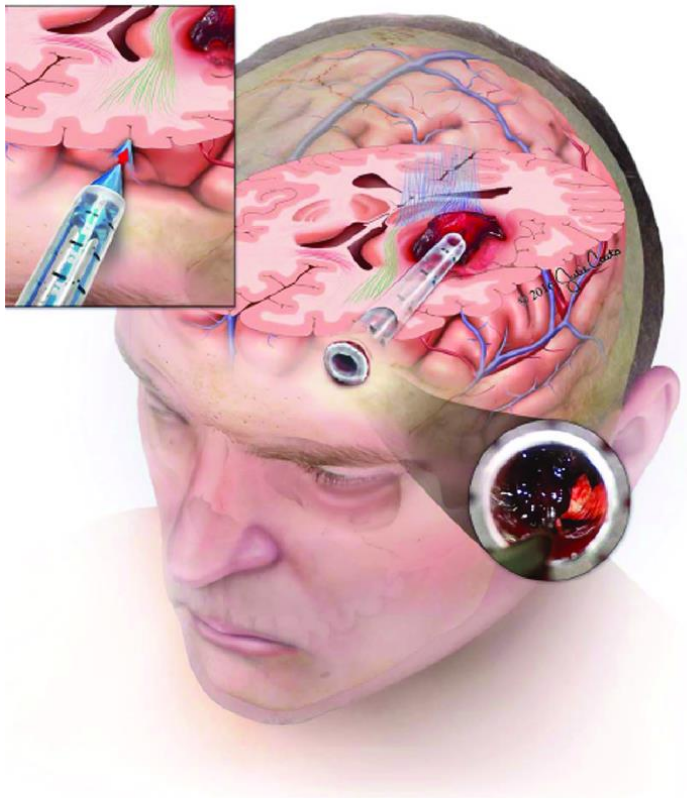
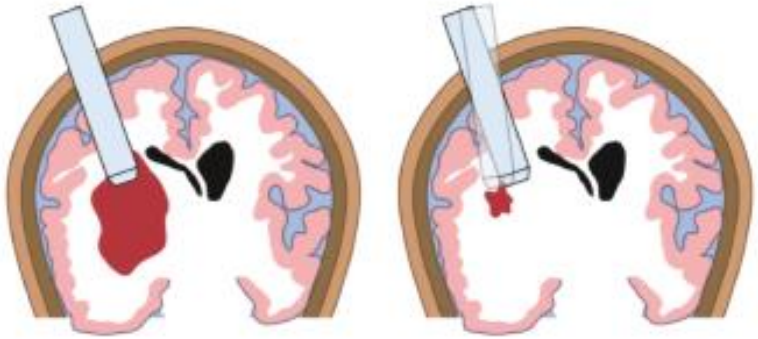
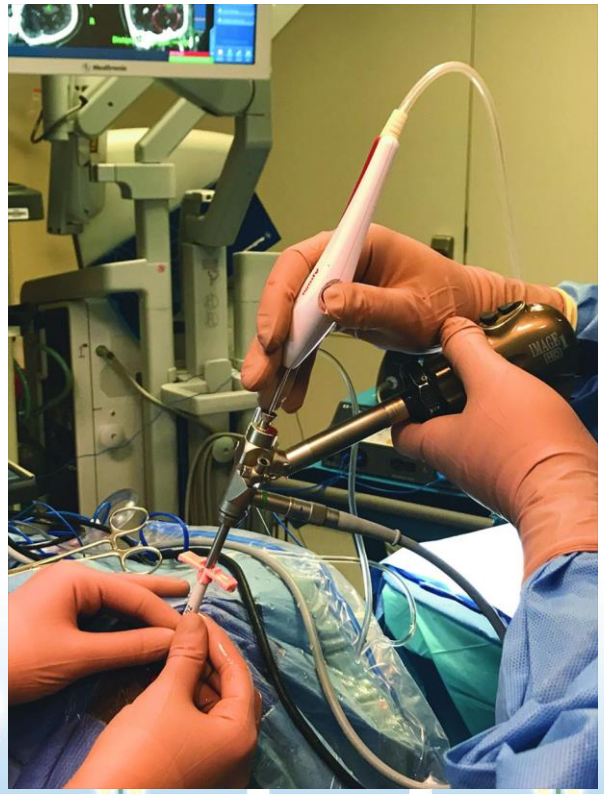
- Significativa reducción del tamaño del hematoma en el grupo MIS
- Puede disminuir la mortalidad
- Es una técnica segura para la evacuación de la HIC aunque únicamente si se logra un hematoma residual < 15 ml post tratamiento podría mejorar el pronóstico funcional de los pacientes.

Técnicas MIS mecánicas

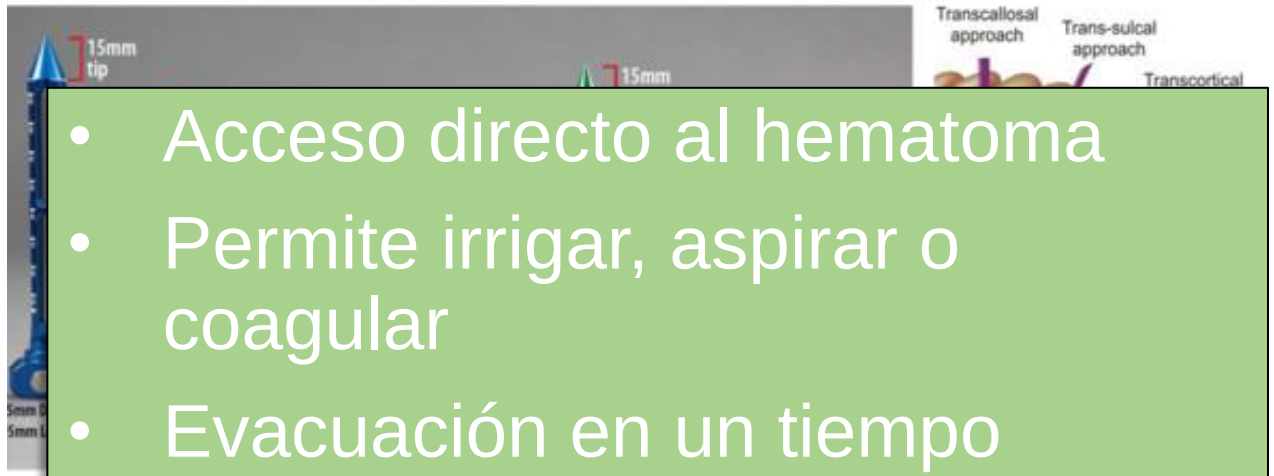






Sistemas tubulares (endoport)

NICO BRAINPATH



- Acceso directo al hematoma
- Permite irrigar, aspirar o coagular
- Evacuación en un tiempo

NICO CORPORATION

- Requiere craneotomía
- Lesión del tejido cerebral por el abordaje

Sistemas tubulares (endoport)

NICO BRAINPATH

Review > World Neurosurg. 2020 Feb:134:155-163. doi: 10.1016/j.wneu.2019.08.218. Epub 2019 Sep 9.

The Use of BrainPath Tubular Retractors in the Management of Deep Brain Lesions: A Review of Current Studies

Samuel Mansour [1], Nikolas Echeverry [2], Stephen Shapiro [2], Brian Snelling [3]

Affiliations + expand

PMID: 31513954 DOI: 10.1016/j.wneu.2019.

Conclusions: This report is the first formal assessment of the BrainPath tubular retraction system, highlighting technical considerations of the retractor from the surgeon's perspective, patient outcomes, and complications. The retractor is a safe, efficacious system that can be used for tumor resection or biopsy and hematoma evacuation. However, further randomized controlled trials are indicated to accurately assess complication rates and outcomes.

Access: Hemorrhagic Stroke

NICO myriad

NICO BrainPath™

Sistemas tubulares (endoport)

NICO BRAINPATH

Cureus
Open Access Technical Report
DOI: 10.7759/cureus.16124

Use of the Image Guided Minimally Invasive BrainPath System to Evacuate Spontaneous Cerebellar Hemorrhages

Kainaat Javed [1], Mousa K. Hamad [1], Ryan Holland [1], Adisson N. Fortunel [1], Adam Ammar [1], Phillip C. Cezayirli [1], Neil Haranhalli [1], David J. Altschul [1]

1. Neurological Surgery, Montefiore Medical Center, Moses Campus, New York, USA

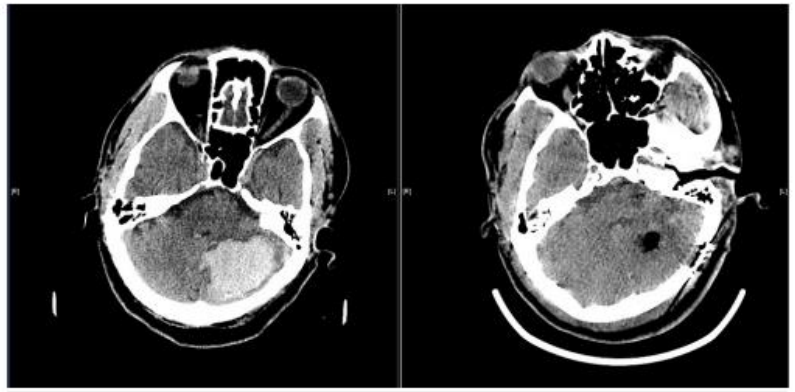


FIGURE 4: Pre and Post Operative CT Scan

Pre-operative and Post-Operative CT scans of our patient are shown for a side by side comparison.

Sistemas tubulares (endoport)

NICO BRAINPATH

OPERATIVE TECHNIQUE

BrainPath-Mediated Resection of a Ruptured Subcortical Arteriovenous Malformation

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M. Adeeb Sebai, MBBS[§]
Mark D Bain, MD[*‡]

*Department of Neurosurgery, Cleveland Clinic, Cleveland, Ohio; ‡Cerebrovascular Center, Cleveland Clinic, Cleveland, Ohio; §College of Medicine, Alfaisal University, Riyadh, Saudi Arabia

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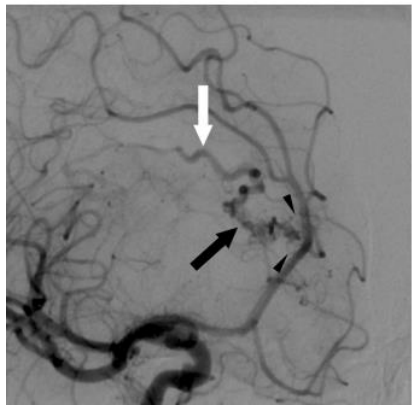
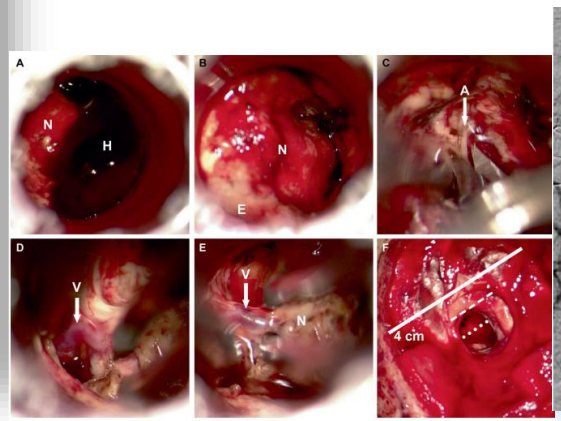
Received, March 7, 2017.
Accepted, July 19, 2017.
Published Online, August 16, 2017.

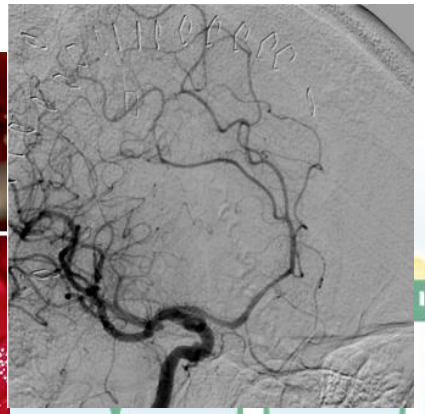
BACKGROUND: Although tubular retractor systems have gained popularity for other indications, there have been few reports of their use for arteriovenous malformation (AVM) surgery. A patient was diagnosed with a ruptured 1.2-cm subcortical AVM after presenting with intracerebral hemorrhage in the right frontal lobe and anterior basal ganglia. The characteristics of this AVM made it amenable to resection using a tubular retractor.
OBJECTIVE: To demonstrate the feasibility and safety of AVM resection using a tubular retractor system.
METHODS: Resection of the ruptured 1.2-cm subcortical AVM was performed utilizing the BrainPath™ (NICO corp, Indianapolis, Indiana) tubular retractor system.
RESULTS: The BrainPath™ approach provided sufficient visualization and surgical freedom to permit successful AVM resection and hematoma evacuation. Postoperative imaging demonstrated near total hematoma removal and angiographic obliteration of the AVM. There were no complications, and the patient made an excellent recovery.
CONCLUSION: Tubular retractors warrant consideration for accessing small, deep, ruptured AVMs. The nuances of such systems and their role in AVM surgery are discussed.

KEY WORDS: Arteriovenous malformation, Cerebral hemorrhage, Craniotomy, Minimally invasive surgical procedures, Case report

Operative Neurosurgery 15:32–38, 2018 DOI: 10.1093/ons/opx186

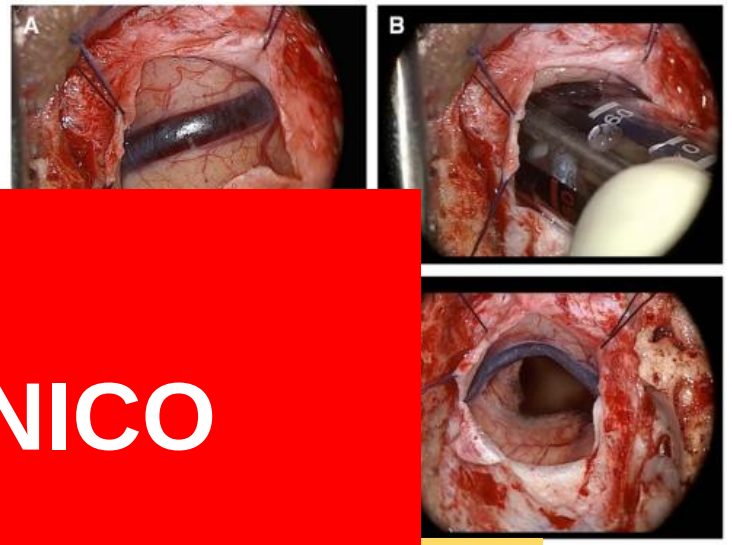






Sistemas tubulares (endoport)

NICO BRAINPATH



Multicenter Study > Neurosurgery. 2017 Apr 1;80(4):515-524.
doi: 10.1227/NEU.0000000000001316.

The Safety and Feasi
BrainPath-Mediated
Evacuation: A Multic

Mohamed A Labib [1], Mitesh Shah [2], A
Anthony Maioriello [5], Gavin Britz [6], Ch
Gustavo Pradilla [11], Richard Rovin [3], Charles Kulwin [-], Julian Ba

NO ENSAYO CLÍNICO

- Reducción del hematoma mayor de 90% en el 72% de los pacientes.
- Buena recuperación funcional en 52%
- **Método seguro para evacuación de HIC**

Sistemas tubulares (endoport)

NICO BRAINPATH

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Trial of Early Minimally Invasive Removal of Intracerebral Hemorrhage

G. Pradilla, J.J. Ratcliff, A.J. Hall, B.R. Saville, J.W. Allen, G. Paulon, A. McGlothlin, R.J. Lewis, M. Fitzgerald, A.F. Caveney, X.T. Li, M. Bain, J. Gomes, B. Jankowitz, G. Zenonos, B.J. Molyneaux, J. Davies, A. Siddiqui, M.R. Chicoine, S.G. Keyrouz, J.A. Grossberg, M.V. Shah, R. Singh, B.N. Bohnstedt, M. Frankel, D.W. Wright,

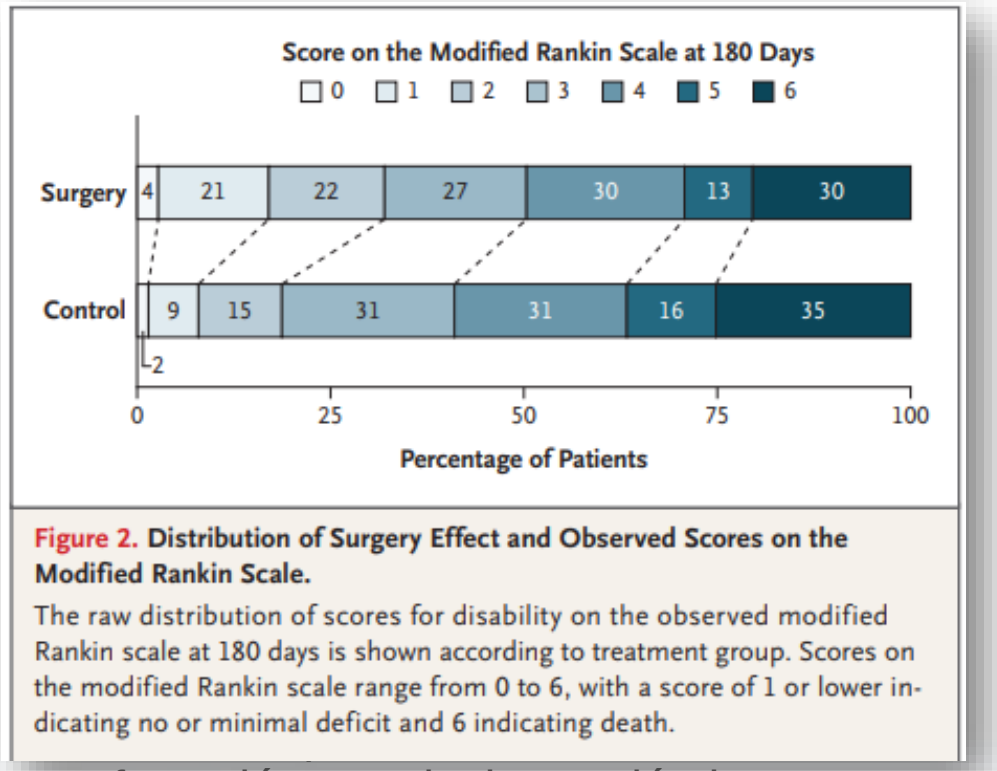


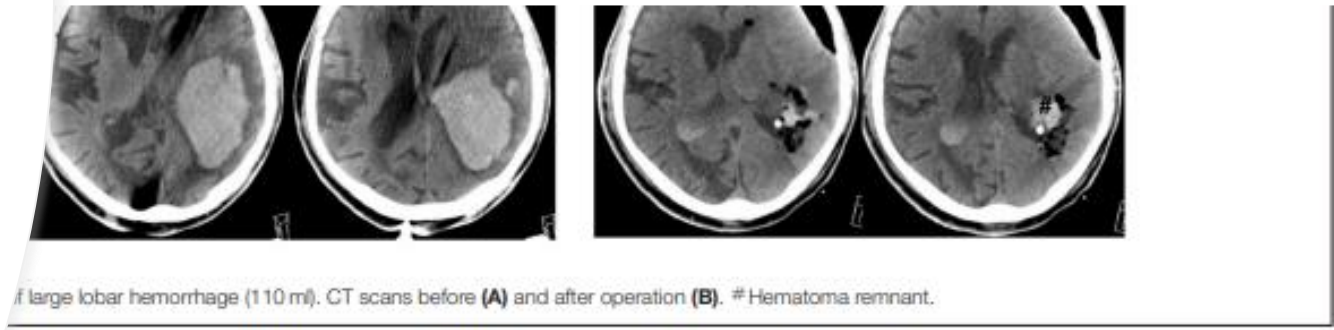
Figure 2. Distribution of Surgery Effect and Observed Scores on the Modified Rankin Scale.

The raw distribution of scores for disability on the observed modified Rankin scale at 180 days is shown according to treatment group. Scores on the modified Rankin scale range from 0 to 6, with a score of 1 or lower indicating no or minimal deficit and 6 indicating death.

- Mejor evolución funcional a los 180 días con cirugía
- El resultado **podría ser atribuible** a la mejoría por cirugía de **hematomas lobares**

CIRUGÍA ENDOSCÓPICA

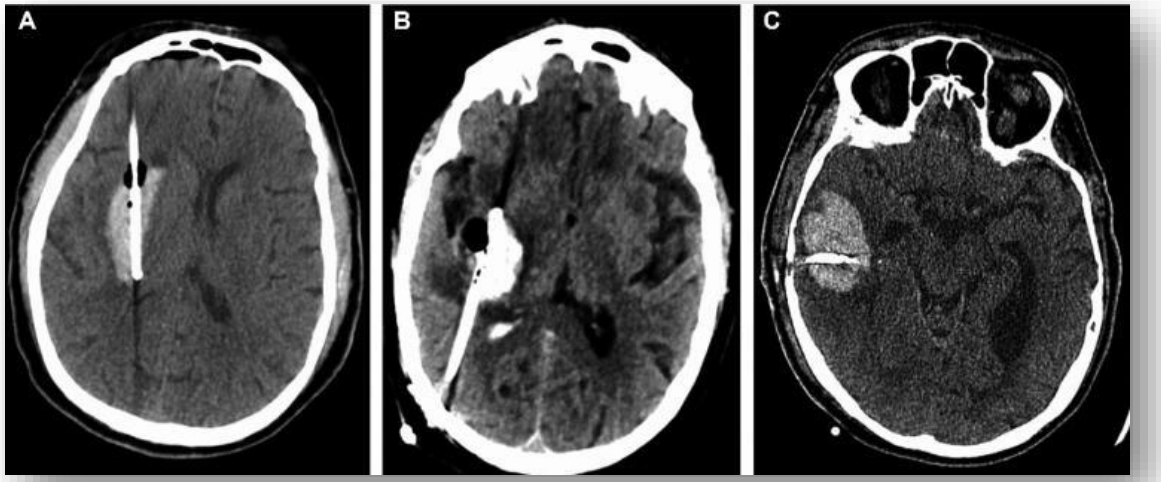
- Evacuación de hematomas mediante **visión directa**
- Acceso **mínimamente invasivo**
- Permite realizar **hemostasia**
  - mayor evacuación
  - menor tiempo quirúrgico
  - menor pérdida sanguínea
  - mejor recuperación funcional
  - menor tiempo de ingreso



f large lobar hemorrhage (110 ml). CT scans before **(A)** and after operation **(B)**. # Hematoma remnant.

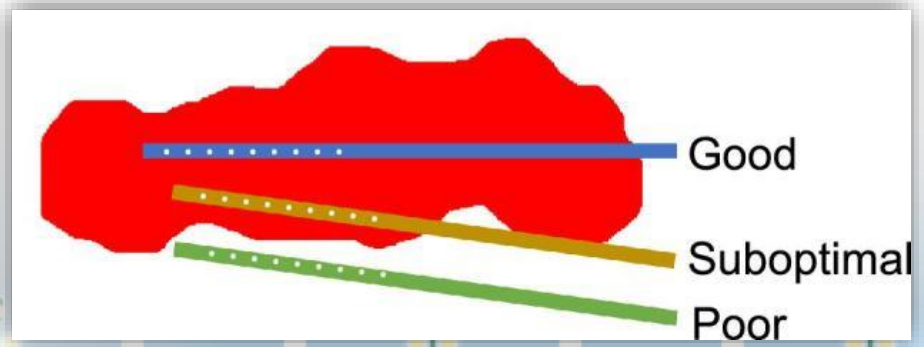
Cirugía endoscópica en la HIC: Stereotactic ICH Underwater Blood Aspiration (SCUBA)

Procedimiento quirúrgico

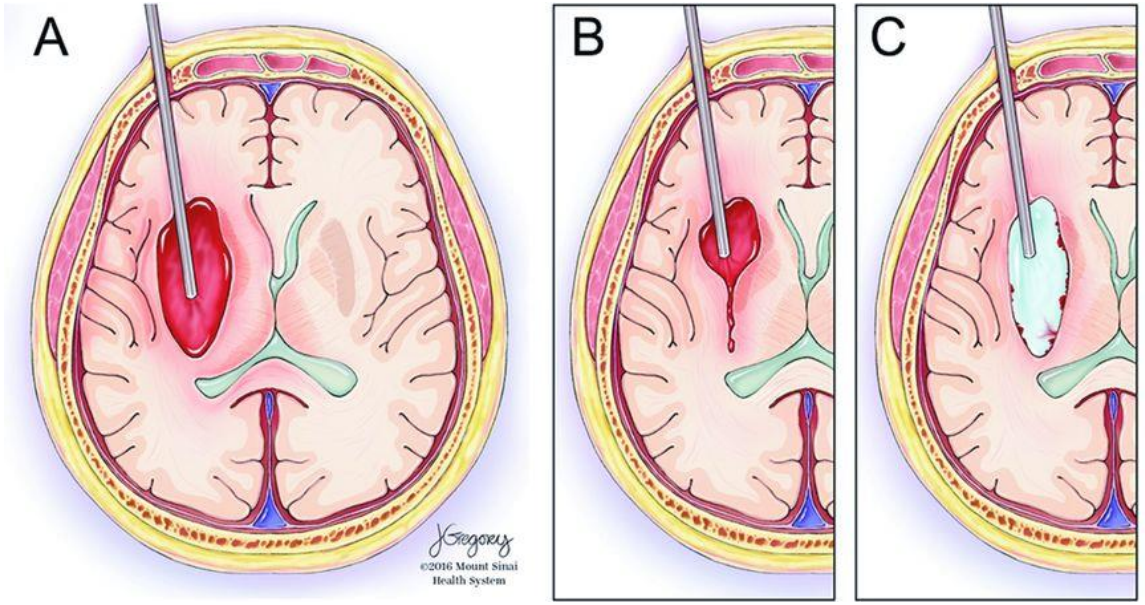


Planificación quirúrgica:

- **Punto de entrada y trayectoria**
  - A lo largo del eje mayor del hematoma
  - A través del centro del hematoma y 2/3 profundidad
  - Tener en cuenta vasos prominentes en el trayecto
  - Trabajar de distal a proximal
  - Ganglios basales: frontal supraciliar
  - Lobares: variable



Cirugía endoscópica en la HIC (SCUBA): Procedimiento quirúrgico



1. Incisión 3cm / Trépano 14 mm
2. Corticotomía, muestras de tejido subcortical
3. Introductor 19F navegado, drenaje pasivo
4. Introducción neuroendoscopio y dispositivo aspirativo para evacuar coágulo

LII Reunión Anual
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7 - 9 de noviembre de 2024
S.E.N.R Sociedad Española de Neurorradiología

Minimally Invasive Endoscopic Intracerebral Hemorrhage Evacuation

Jonathan S. Pan, Alexander G. Chartrain, Jacopo Scaggiante, Olivia S. Allen, Danny Hom, Joshua B. Bederson, J Mocco, and Christopher P. Kellner

Department of Neurosurgery, Icahn School of Medicine at Mount Sinai

Cirugía endoscópica en la HIC:

Published in final edited form as:
Stroke. 2016 November ; 47(11): 2749–2755. doi:10.1161/STROKEAHA.116.013837.

ICES (Intraoperative Stereotactic Computed Tomography-Guided Endoscopic Surgery) for Brain Hemorrhage: A Multicenter Randomized Controlled Trial

Paul Vespa, MD, Daniel Hanley, MD, Joshua Betz, MS, Alan Hoffer, MD, Johnathan Engh, MD, Robert Carter, MD, Peter Nakaji, MD, Chris Ogilvy, MD, Jack Jallo, MD, Warren Selman, MD, Amanda Bistran-Hall, BS, Karen Lane, CMA, Nichol McBee, MPH, Jeffery Saver, MD, Richard E. Thompson, PhD, and **Neil Martin, MD**

- Ensayo clínico. 20 pacientes (hematoma >20ml)
- Reducción inmediata del 71% del hematoma
- Mejor recuperación funcional en los pacientes intervenidos

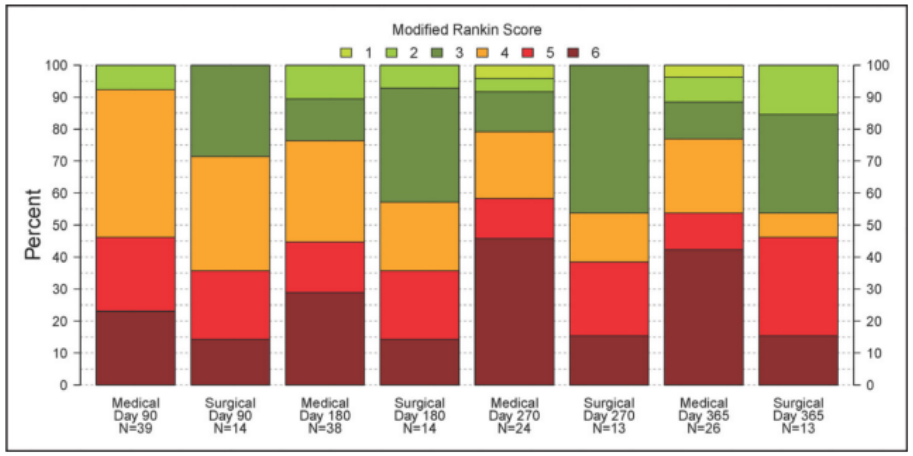


Figure 2.
Distribution of modified Rankin Scale (mRS) over the 365-day follow-up period. mRS scores determined at 90, 180, 270, and 365 days after symptom onset are shown by treatment group. The mRS score of 0 is not displayed because none of the subjects achieved this score during the follow-up period.

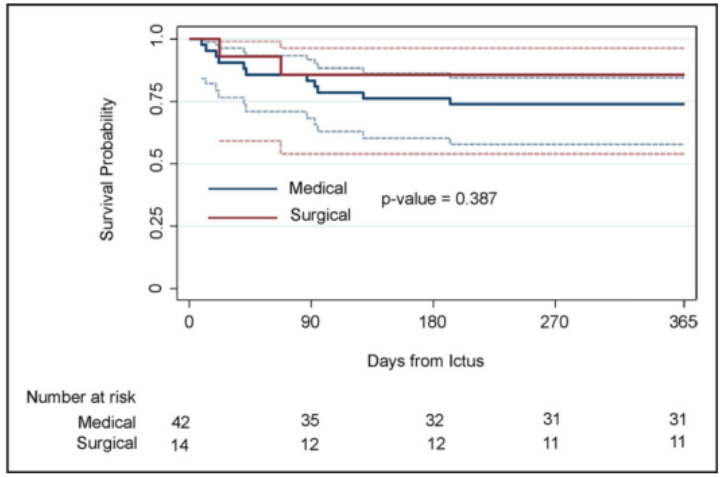


Figure 3.
Kaplan–Meier. Summary of mortality in the surgical and medical groups.

Cirugía endoscópica en la HIC: ENSAYOS CLÍNICOS EN MARCHA

- The Minimally Invasive Endoscopic Surgical Treatment with Apollo vs. Medical Management for Supratentorial ICH **(INVEST)** *(https://clinicaltrials.gov/ct2/show/NCT02654015)*
- Dutch Intracerebral Hemorrhage Surgery Trial **(DIST)** *(https://clinicaltrials.gov/ct2/show/NCT03608423)*
- Artemis in the removal of intracerebral hemorrhage **(MIND)** *(https://clinicaltrials.gov/ct2/show/NCT03342664)*
- The Ultra-Early, Minimally inVAsive intracerebral hemorrhage evacUATion vs. Standard Treatment **(EVACUATE)** *(https://www.clinicaltrials.gov/ct2/show/NCT04434807)*
- Minimally Invasive IntRaceRebral HemORrhage Evacuation **(MIRROR)** *(https://clinicaltrials. gov/ct2/show/NCT04494295)*

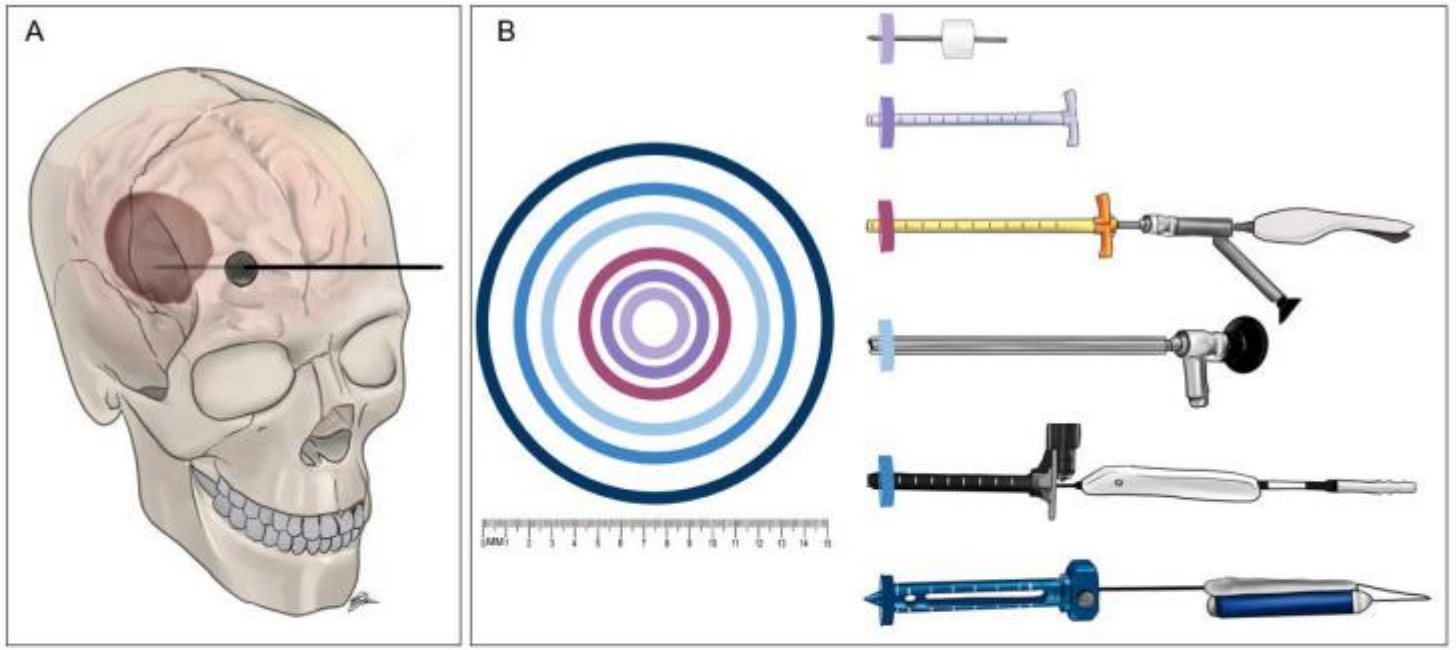


Figure 2. The relative sizes of the instruments of minimally invasive surgery for intracerebral hemorrhage (ICH) evacuation. (**A**) Generic sketch of the minimally invasive approach to intracerebral hemorrhage evacuation. A small craniotomy is made and the chosen device is inserted through the cranial opening and into brain parenchyma until reaching the hematoma. (**B**) Sketches of the ICH evacuation devices with concentric rings demonstrating the widest diameter of the instrument inserted through brain parenchyma for each technique. The color of each concentric ring corresponds to the color at the tip of the device in the illustrations. The devices, from top to bottom, are the craniopuncture YL-1 needle (outer diameter: 3.0 mm), the 14F vascular sheath used in the Minimally Invasive Surgery Plus Rt-PA for ICH Evacuation (MISTIE) procedure (4.8 mm), the Artemis device inserted through a 19F vascular sheath and a 3-port Endoscope such as the Storz Lotta (6.3 mm), the clear sheath used during endoscope-assist procedures (10.0 mm), the Aurora Surgiscope (11.5 mm), and the BrainPath endoport (15.8 mm).

Minimally Invasive Intracerebral Hemorrhage Evacuation Techniques: A Review.
Hannah TC, Kellner R, Kellner CP.
Diagnostics (Basel). 2021 Mar 23;11(3):576. doi: 10.3390/diagnostics11030576.

Stroke

AHA/ASA GUIDELINE

2022 Guideline for the Management of Patients With Spontaneous Intracerebral Hemorrhage: A Guideline From the American Heart Association/American Stroke Association

Reviewed for evidence-based integrity and endorsed by the American Association of Neurological Surgeons and Congress of Neurological Surgeons.

Endorsed by the Society of Vascular and Interventional Neurology

The American Academy of Neurology affirms the value of this statement as an educational tool for neurologists.

Endorsed by the Neurocritical Care Society

Steven M. Greenberg, MD, PhD, FAHA, Chair; Wendy C. Ziai, MD, MPH, FAHA, Vice Chair; Charlotte Cordonnier, MD, PhD; Dar Dowlatshahi, MD, PhD, FAHA; Brandon Francis, MD, MPH; Joshua N. Goldstein, MD, PhD, FAHA; J. Claude Hemphill III, MD, MAS, FAHA; Ronda Johnson, MBA; Kiffon M. Keigher, MSN, ACNP-BC, RN, SCRN; William J. Mack, MD, MS, FAHA*; J. Mocco, MD, MS, FAHA†; Eileena J. Newton, MD; Ilana M. Ruff, MD‡; Lauren H. Sansing, MD, MS, FAHA; Sam Schulman, MD, PhD; Magdy H. Selim, MD, PhD, FAHA; Kevin N. Sheth, MD, FAHA*§; Nikola Sprigg, MD; Katharina S. Sunnerhagen, MD, PhD; on behalf of the American Heart Association/American Stroke Association

Key Words: AHA Scientific Statements ■ cerebral amyloid angiopathy ■ cerebral hemorrhage ■ intracranial hemorrhage ■ prevention ■ recovery ■ treatment

6. SURGICAL INTERVENTIONS

6.1. Hematoma Evacuation

6.1.1. MIS Evacuation of ICH

Recommendations for MIS Evacuation of ICH
Referenced studies that support recommendations are summarized in Data Supplements 55 and 56.

COR	LOE	Recommendations
2a	B-R	1. For patients with supratentorial ICH of >20- to 30-mL volume with GCS scores in the moderate range (5–12), minimally invasive hematoma evacuation with endoscopic or stereotactic aspiration with or without thrombolytic use can be useful to reduce mortality compared with medical management alone.[379–388]
2b	B-R	2. For patients with supratentorial ICH of >20- to 30-mL volume with GCS scores in the moderate range (5–12) being considered for hematoma evacuation, it may be reasonable to select minimally invasive hematoma evacuation over conventional craniotomy to improve functional outcomes.[382,383,385–387,389,390]
2b	B-R	3. For patients with supratentorial ICH of >20- to 30-mL volume with GCS scores in the moderate range (5–12), the effectiveness of minimally invasive hematoma evacuation with endoscopic or stereotactic aspiration with or without thrombolytic use to improve functional outcomes is uncertain.[379–385,387,388]

6.1.3. Craniotomy for Supratentorial Hemorrhage

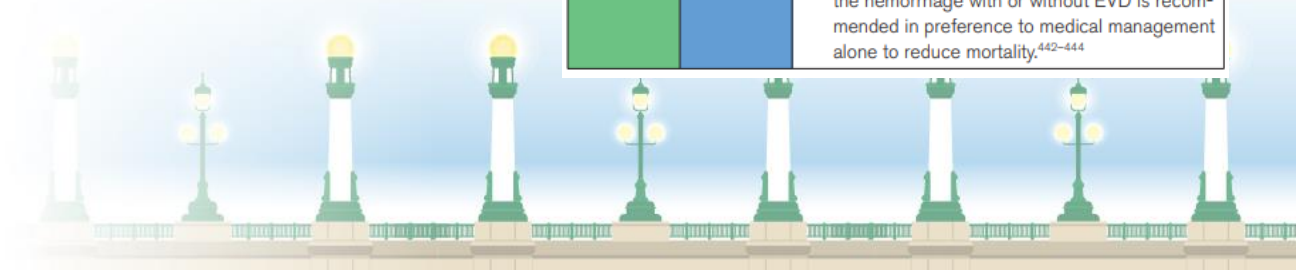
Recommendations for Craniotomy for Supratentorial Hemorrhage
Referenced studies that support recommendations are summarized in Data Supplements 63 and 64.

COR	LOE	Recommendations
2b	A	1. For most patients with spontaneous supratentorial ICH of moderate or greater severity, the usefulness of craniotomy for hemorrhage evacuation to improve functional outcomes or mortality is uncertain.[380,382,384,393,429–431]
2b	C-LD	2. In patients with supratentorial ICH who are deteriorating, craniotomy for hematoma evacuation might be considered as a lifesaving measure.[382,384,429,432]

6.1.4. Craniotomy for Posterior Fossa Hemorrhage

Recommendations for Craniotomy for Posterior Fossa Hemorrhage
Referenced studies that support recommendations are summarized in Data Supplement 65.

COR	LOE	Recommendation
1	B-NR	1. For patients with cerebellar ICH who are deteriorating neurologically, have brainstem compression and/or hydrocephalus from ventricular obstruction, or have cerebellar ICH volume ≥15 mL, immediate surgical removal of the hemorrhage with or without EVD is recommended in preference to medical management alone to reduce mortality.[442–444]



Int J Med Robot. 2019 Oct;15(5):e2024. doi: 10.1002/rcs.2024. Epub 2019 Jul 25.

Neurosurgery medical robot Remebot for the treatment of 17 patients with hypertensive intracerebral hemorrhage

Tao Wang [1], Quan-Jun Zhao [1], Jian-Wen Gu [1], Tie-Jun Shi [1], Xujun Yuan [2], Jia Wang [1], Shao-Jie Cui [1]

Meta-Analysis

J Clin Neurosci. 2020 Dec;82(Pt B):252-259. doi: 10.1016/j.jocn.2020.10.045. Epub 2020 Nov 26.

Robot-assisted neurosurgery versus conventional treatment for intracerebral hemorrhage: A systematic review and meta-analysis

Ruochu Xiong [1], Fangye Li [2], Xiaolei Chen [3]

LII Reunión Anual SOCIEDAD ESPAÑOLA DE NEURORRADIOLOGÍA
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S.E.N.R Sociedad Española de Neurorradiología

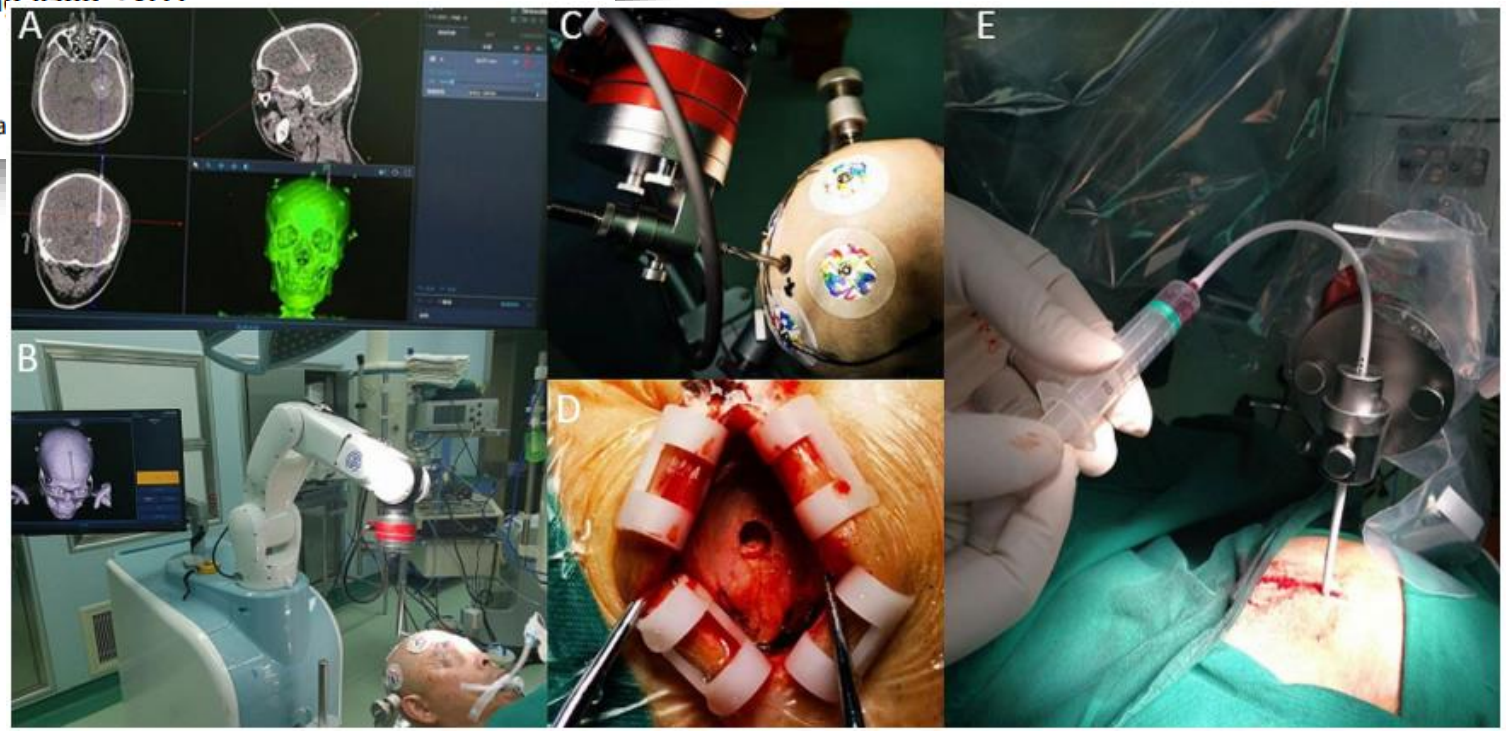
Neurosurgical Review (2024) 47:359
https://doi.org/10.1007/s10143-024-02614-7

RESEARCH

The efficacy of robot-assisted surgery on minor basal ganglia cerebral hemorrhage with neurological dysfunction

Weijie Zhong[1] · Xuchen Meng[1] · Lin Zhu[1] · Xiaosheng Yang[1] · Wei Wang[1] · Zhaoliang Sun[1] · Yingfan Xiong[1] · Yang Wang[1] · Zhixin Duan[1] · Shenghua Chu[1] · Wenchuan Zhang[1] · Xiufeng Jiang[1] · Yi Li[1]

Received: 27 February 2024 / Revised: 10 June 2024 / Accepted: 23 July 2024



Conclusiones:

- La hemorragia intracerebral espontánea sigue siendo una de las enfermedades más letales e incapacitantes y con una elevada carga económica para la sociedad
- Hasta la fecha no se ha demostrado claramente que la cirugía mejore el pronóstico de los pacientes
- La cirugía mínimamente invasiva puede reducir el daño cerebral secundario con una potencial reducción de la mortalidad y dependencia
- Las nuevas tecnologías podrían mejorar la precisión y la seguridad de la cirugía MIS
- Nuevos ensayos clínicos pueden mostrar en un futuro cercano un mayor grado de evidencia acerca de la selección de pacientes quirúrgicos y de los nuevos enfoques mínimamente invasivos


ESKERRIK ASKO