Neurosurgical Management of ICH: Making Sense of ENRICH, SWITCH, STICH and MISTIE

Hiren C. Patel, PhD, FRCS
Consultant Neurosurgeon
Greater Manchester Neuroscience Centre
Manchester, United Kingdom

Resource Information

About This Resource

These slides are one component of a continuing education program available online at MedEd On The Go titled What's New in Treating the Anticoagulated Patient with ICH?

Program Learning Objectives:

- Describe the various therapies necessary to manage the care of anticoagulated patients with ICH in the neurocritical care setting, including reversal and repletion
- Illustrate the latest neurosurgical clinical trial data to optimize care for patients with ICH
- Categorize the specific recommendations from the recent ESO guidelines on the management of ICH in the anticoagulated patient and describe approaches to implement them
- Outline the 3 elements of ICH care bundling and how each optimizes the care of the anticoagulated patient

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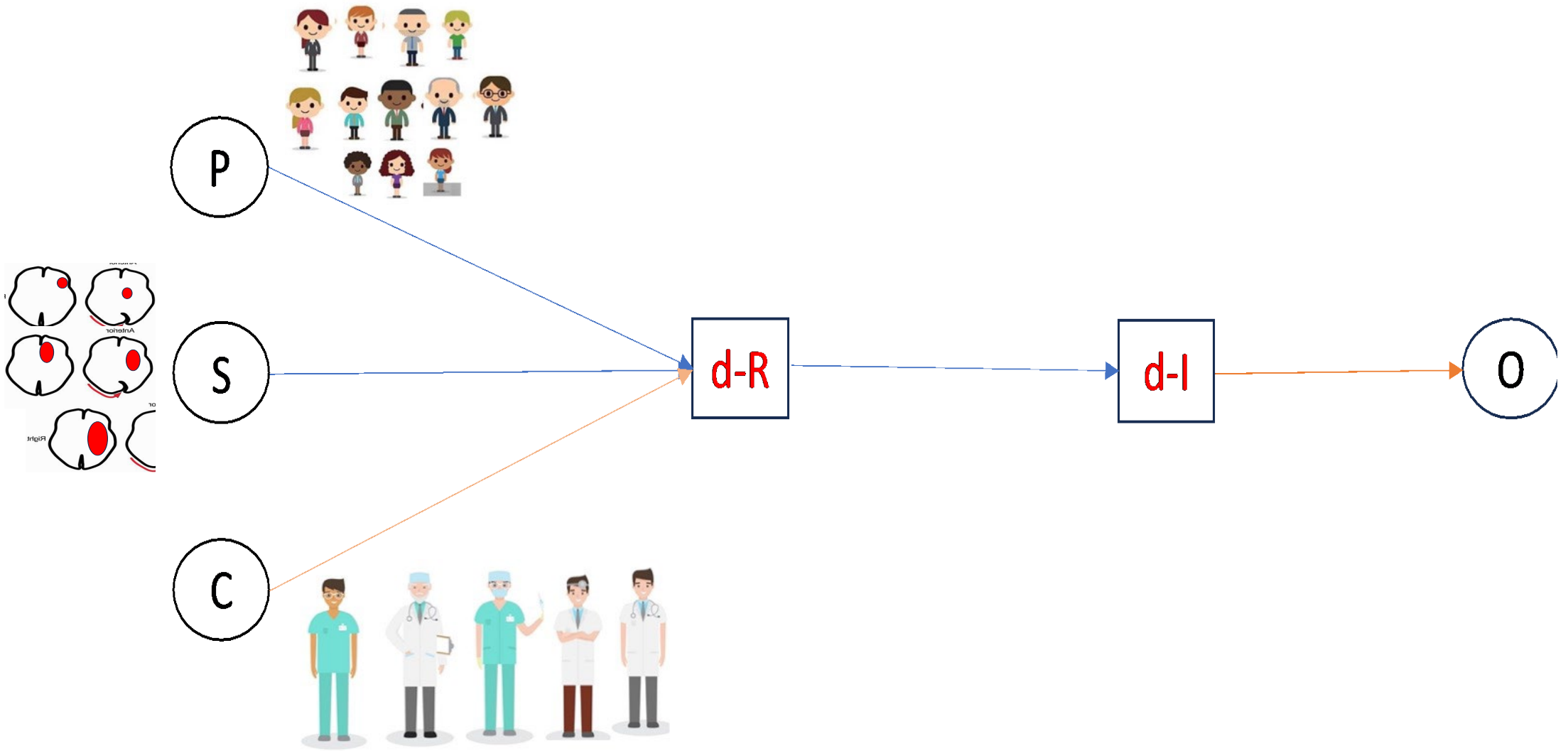
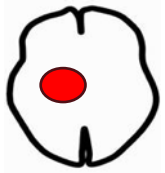
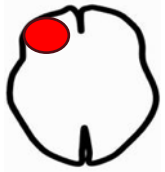
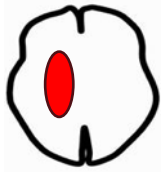
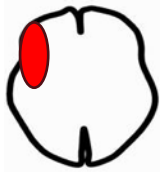
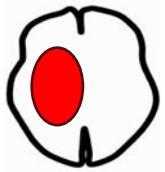
How I Understand ICH Results From Clinical Trials…



ICH, intracerebral hemorrhage.

How I Understand ICH… and Role of Surgery

Scan findings	Why are you operating?	Consideration of coma	R-Risk of surgery/clot removal method	Probability of recovery w/out surgery?	Who are you going to operate on?	When are you going to operate	Patient factors
	Secondary injury	Unlikely to result in coma	High/minimally invasive	Moderate/high	No	Soonish	Age Co-morbidities Tolerate surgery and ICU care 'End of the bed test'
	Secondary injury	Unlikely to result in coma	High/minimally invasive or craniotomy	High	No	Soonish	
	Remove mass effect	Likely signifies brain stem injury	Low/minimally invasive	Uncertain	Perhaps	Asap	
	Remove mass effect	Likely signifies brain stem injury	Low/either minimally invasive or craniotomy	Uncertain	Yes	Asap	
	Futile	Futile	Futile	Futile	Futile	Futile	

Asap, as soon as possible; ICU, intensive care unit.

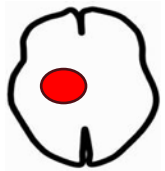
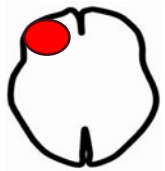
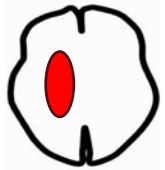
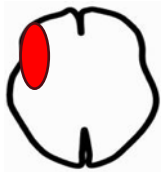
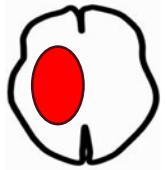
STICH, MISTIE, ENRICH, and SWITCH

Surgical Trial	Inclusion criteria	Exclusion criteria	Rationale	Timing	Demographics	ICH removed	Method of surgery	Outcome Int vs control
STICH I (2005)[1]	Minimum 2cm diameter ICH GCS >5	Severe comorbidities Brain stem extension	effect of reducing mass effect by surgery on outcome	30 hours (16-49) 16% within 12h of ictus	Median age 62(52-70) Clot size (40 cc) Lobar 39% Deep 42% (GCS<8- 26%)		Craniotomy (75%)	26% vs 24% Prognosis based Favourable (33 vs 28)
STICH II (2015)[2] 3984 601 randomised	Lobar ICH (<1cm of the cortex) 10-100 ml GCS m 5 or 6	Deep hemorrhage Severe comorbidities	effect of reducing mass effect by surgery on outcome in well patients with a lobar ICH	26 hours (15-69) 17% within 12h of ictus	Median age 65(55-74) Clot size (38 cc)		Craniotomy	56% vs 53% Prognosis based Favourable (33 vs 28)
MISTIE (2019)[3] 16,000 screened 506 randomised	Age 18-80 GCS<14 Clot stability ICH vol >30ml Tight surgical control	Irreversible brain injury Coagulopathy	effect of reducing mass effect by minimally invasive surgery	Sweet spot suggested as 36 to 48 hours post ictus	Median age 62(52-70) Clot size (45.8 cc) Deep 65% (GCS<8- 26%)	Median end of treatment (12.5) 70% achieved end of treatment goal	Minimially invasive passive clot evacuation following clot dissolution	Favourable outcome 19% vs 16.4% 24.8% vs 17.5% (<15 mls left post surgery)
ENRICH (2023)[4] Screened 11,000 screened 300 randomised	Age 18-80 GCS<14 ICH volume 30-80 ml	IVH- ventricular cast Thalamic haemorrhage Fixed Pupils, or extensor posturing) Severe comorbidities Limited life expectancy	effect of reducing mass effect by minimally invasive surgery	16.75 hours (10.70-21.25	Median Age-64 Median clot size-54cc Lobar ICH-68% Deep ICH-32%	Median end of treatment vol 14.9mls >70% ICH reduction 71.3%	Minimally invasive, para fascicular approach to clot	Favourable outcome 47% vs 26%
SWITCH[5]	Deep basal ganglia/thalamus ICH volume >30ml<100ml	Comatosed Lobar ICH	Minimize harm from invasive surgery Control ICP	Within 72 hours		n/a	Craniectomy	

GCS, Glasgow Coma Scale; ICP, intracranial pressure; IVH, intraventricular hemorrhage.

1. Mendelow AD, Gregson BA, Fernandes HM, et al. *Lancet*. 2005;365(9457):387-97; 2. Mendelow AD, Gregson BA, Rowan EN, et al. *Lancet*. 2013;382(9890):397-408; 3. Hanley DF, Thompson RE, Rosenblum M, et al. *Lancet*. 2019;393(10175):1021-1032. doi: 10.1016/S0140-6736(19)30195-3; 4. Pradilla G, Ratcliff JJ, Hall AJ, et al. *N Engl J Med*. 2024;390(14):1277-1289; 5. Fischer U, Fung C, Beyeler S, et al. *Eur Stroke J*. 2024:23969873241231047.

How I Understand ICH… and Role of Surgery

	Why are you operating?	Likely hood of good recovery without surgery?	R-Risk of surgery/clot removal method	When are you going to operate	Consideration of coma	Any other thoughts
	Secondary injury	Moderate/high	High/minimally invasive	Soonish	Unlikely to result in coma	White matter disease Dominant hemisphere Co-morbidities Tolerate surgery and ICU care
	Secondary injury	High	High/minimally invasive or craniotomy	Soonish	Unlikely to result in coma	
	Remove mass effect	Uncertain	Low/minimally invasive	Asap	Likely signifies brain stem injury	
	Remove mass effect	Uncertain	Low/either minimally invasive or craniotomy	Asap	Likely signifies brain stem injury	
	Futile	Futile	Futile	Futile	Futile	

The Story for Role of Surgery Is Evolving

Trial	Location	Intervention	Treatment Window	Volume	Recruitment Target	Estimated Study Completion
DIST	Netherlands	Minimally invasive endoscopy-guided surgery – Penumbra	< 8 h	≥ 10 ml	600	July 2026
EMINENT-ICH	Switzerland	Minimally invasive endoscopy-guided surgery	< 24 h	20-100 ml	200	Sep 2028
NESICH	China	Minimally invasive endoscopy-guided surgery	< 24 h	> 25 ml	560	Sep 2026
EVACUATE	Australia	Minimally invasive hematoma evacuation – Aurora surgiscope and evacuator	< 8 h	> 20 ml	240	Dec 2026

Summary

Which patients should surgery be considered?

- Patients likely to be able to tolerate surgery, ICU care, and potential for prolonged hospitalisation
- Non-comatose

What is the optimal size of an ICH that should be considered for surgery?

- An ICH causing mass effect (>30cc)

When should surgery be performed?

- As soon as possible

What is the safest approach?

- Minimally invasive image-guided surgery using a strategy that avoids destruction of eloquent pathways is key

What should the end point of surgery be?

- If the decision is to remove the clot, then the end goal should be total or near total clot removal (<15ml)

Multiple Choice Question

Which patient is likely to have the best outcome following surgery for ICH?

A. 63-year-old man, nursing home resident, sudden collapse 6 hours ago, not anticoagulated/no antiplatelets, GCS 11, 10 mls deep ICH (ABC/2 score)

B. 63-year-old man, pre-retirement builder, hypertensive, sudden collapse 6 hours ago, not anticoagulated/no antiplatelets, GCS 9-12, 50 mls deep ICH (ABC/2 score)

C. 53-year-old man, multiple co-morbidities, hypertensive, sudden collapse 6 hours ago, not anticoagulated/no antiplatelets, GCS 9-12, 50 mls deep ICH (ABC/2 score)

D. 70-year-old man, active, hypertensive, sudden collapse 6 hours ago, not anticoagulated/no antiplatelets, GCS 9-12, 40 mls lobar ICH (ABC/2 score)

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