

A photograph of two surgeons in blue scrubs and masks performing a brain surgery in an operating room. The surgeons are focused on the patient, who is lying on a table. The room is brightly lit with surgical lamps. The text "腦中風(梗塞/出血)的外科治療" is overlaid in red on the image.

# 腦中風(梗塞/出血)的外科治療

神經外科 丁俊瑋

# 缺血性腦中風 vs. 出血性腦中風

## Ischemic stroke vs. Hemorrhagic stroke

- 缺血性腦中風(Ischemic stroke)

1. 血栓型(thrombus)

2. 血流灌注不足(Insufficiency)

- 出血性腦中風(Hemorrhagic stroke)

1. 高血壓性出血(Hypertensive)

2. 特殊型態的出血(動脈瘤、動靜脈畸型、腦腫瘤出血...)



# 神經外科醫師於缺血性(Ischemic)腦中風的角色-1

- 改善大血管梗塞(Large vessel ischemic stroke)造成的顱內高壓 (intracranial hypertension) 、
- 移除出血性變化血塊(hemorrhage transformation)
  - Decompressive craniectomy去骨瓣減壓手術/顱下(sub-temporal)減壓手術
  - Hematoma evacuation
  - ICP monitor 腦壓監測器植入

CME Available

## Decompressive Surgery for the Treatment of Malignant Infarction of the Middle Cerebral Artery (DESTINY)

A Randomized, Controlled Trial

Eric Jüttler, MD; Stefan Schwab, MD, PhD; Peter Schmiedek, MD, PhD;  
Andreas Unterberg, MD, PhD; Michael Hennerici, MD, PhD; Johannes Woitzik, MD;  
Steffen Witte, PhD; Ekkehart Jenetzky, MD; Werner Hacke, MD, PhD;  
for the DESTINY Study Group\*

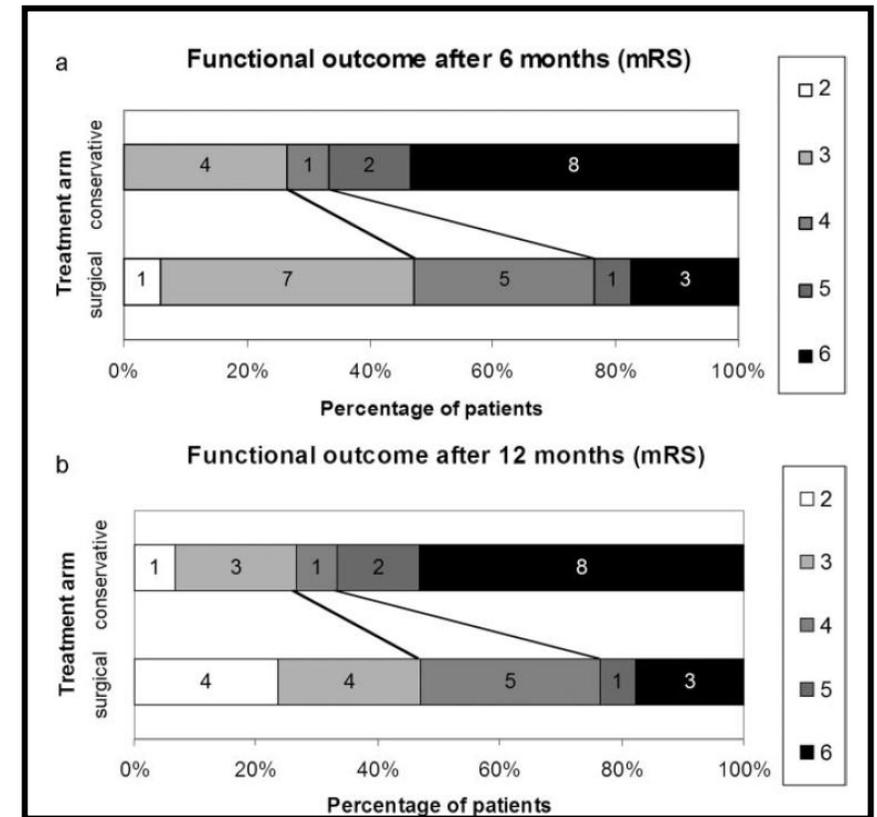
## Protocols

### DESTINY II: DEcompressive Surgery for the Treatment of malignant INfarction of the middle cerebral artery II

Eric Jüttler<sup>1,2\*</sup>, Julian Bösel<sup>1</sup>, Hemasse Amiri<sup>1</sup>, Petra Schiller<sup>3</sup>, Ronald Limprecht<sup>3</sup>,  
Werner Hacke<sup>1</sup>, and Andreas Unterberg<sup>4</sup>, for the DESTINY II Study Group

➔  Surgical decompression for space-occupying cerebral infarction (the Hemicraniectomy After Middle Cerebral Artery infarction with Life-threatening Edema Trial [HAMLET]): a multicentre, open, randomised trial

Jeannette Hofmeijer, L Jaap Kappelle, Ale Algra, G Johan Amelink, Jan van Gijn, H Bart van der Worp, for the HAMLET investigators\*



- 結論一:中風<48 小時內進行減壓有較高的存活率,>96小時則沒有差別
- 結論二:功能性預後沒有太大差別

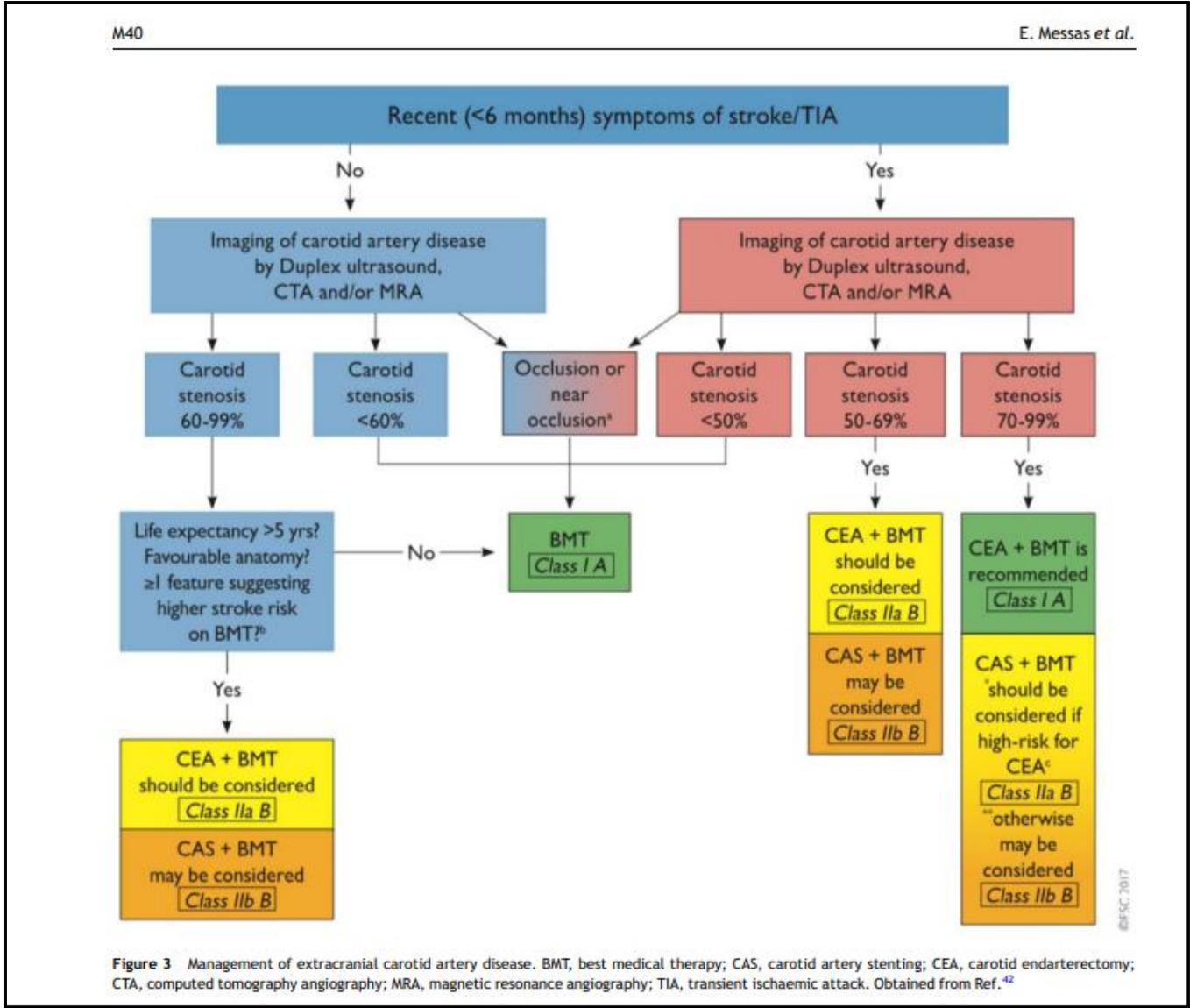
# 神經外科醫師於缺血性(Ischemic)腦中風的角色-2

- 頸動脈血管內皮切除術Carotid endarectomy
- 顱內顱外血管橋接手術External carotid(EC)artery-Internal carotid(IC)artery bypass
- Moya-moya disease 毛毛樣血管疾病:慢性進行性腦血管閉塞疾病，主要的原因是由於顱內大血管閉塞，導致小血管代償性雜亂生長，
- Ischemic stroke 腦梗塞

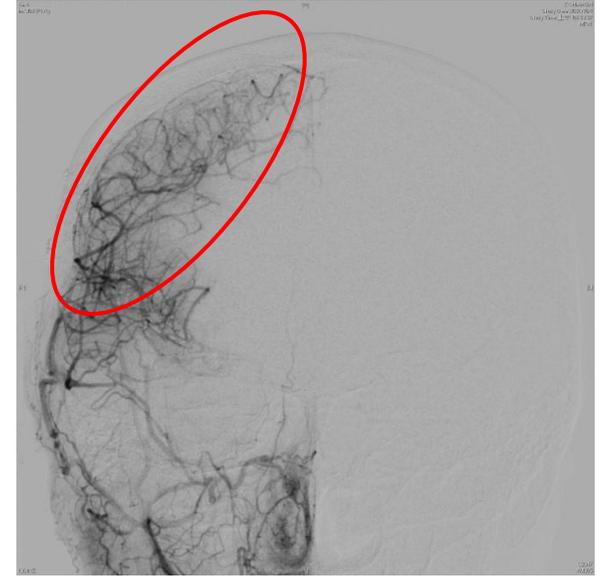
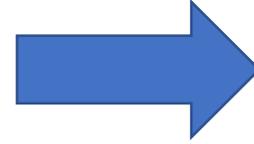
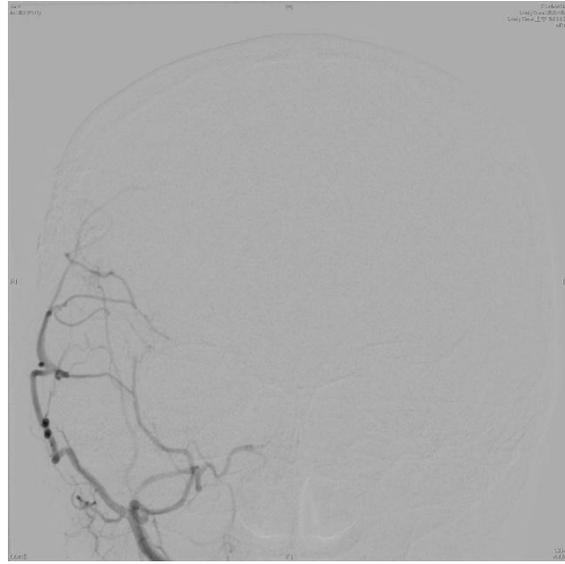
# Carotid endarterectomy

血管內皮去除手術與內頸動脈支架，為內頸動脈狹窄相關腦梗塞的主要兩種治療方式。

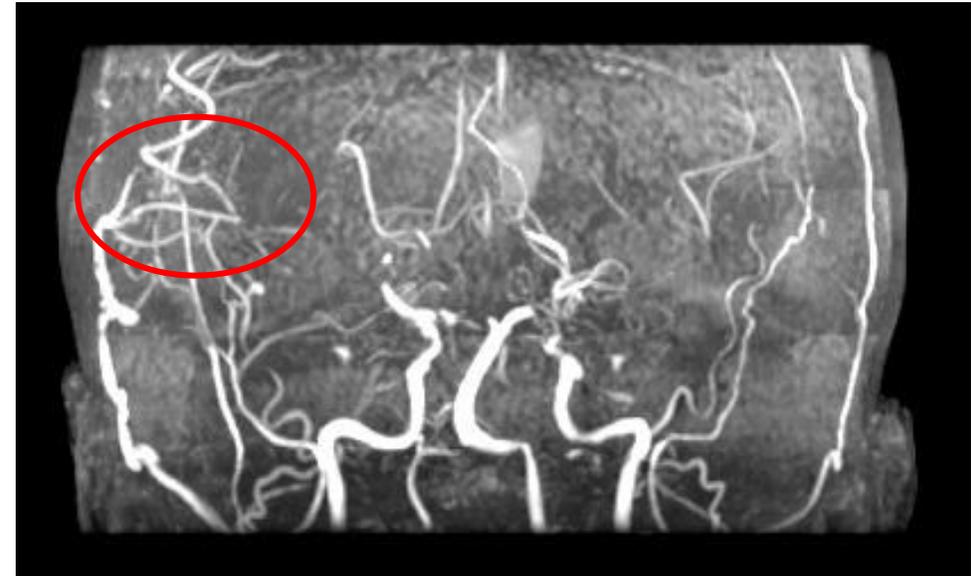
*Management of carotid stenosis for primary and secondary prevention of stroke: state-of-the-art 2020: a critical review, E. Messas et al.*



# 顱內顱外血管橋接手術

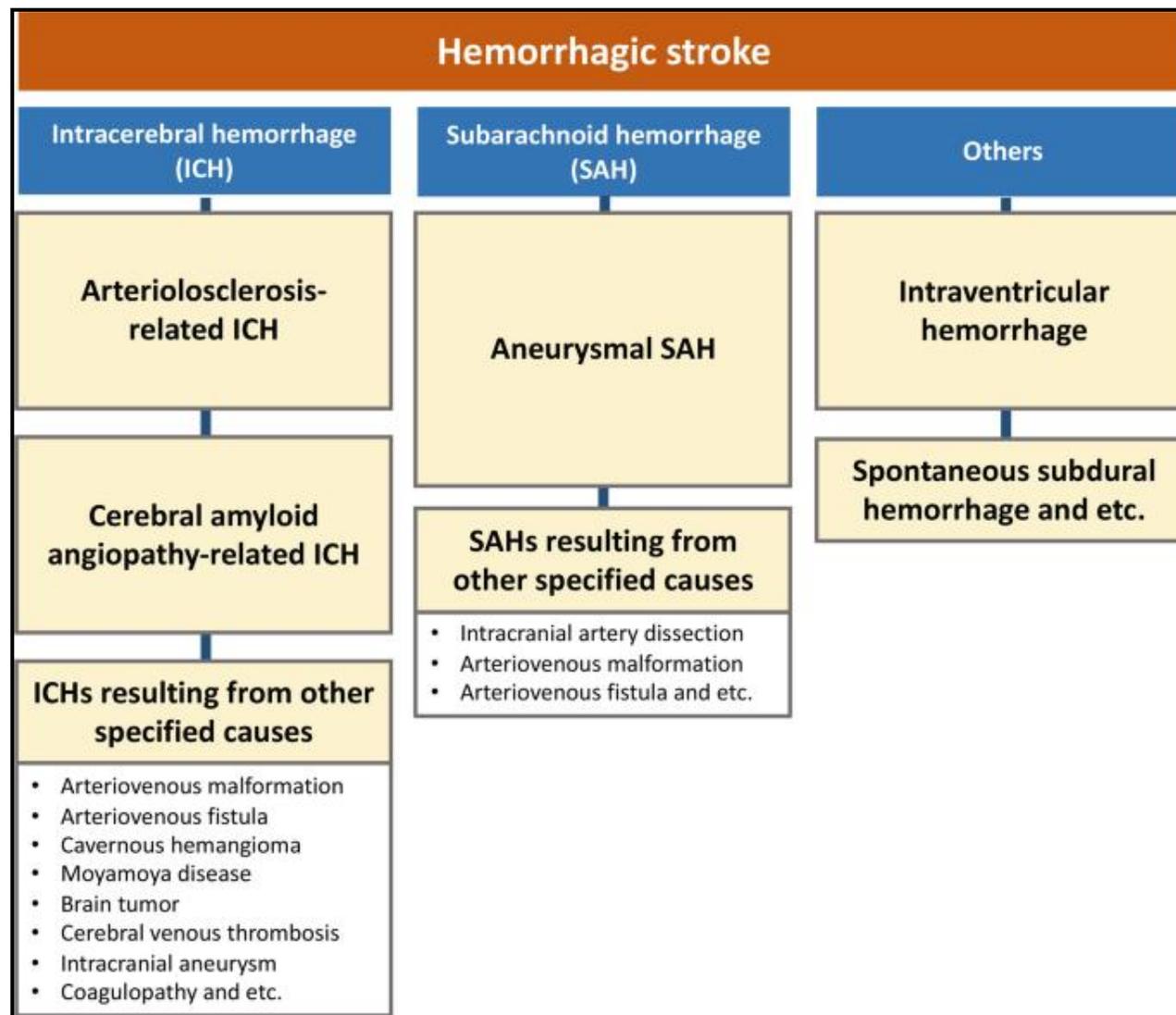


- 上圖:術前血管攝影:左側毛毛樣血管病變
- 左圖:術中完成繞道後照片
- 右圖:術後血管攝影:接通的血管



# 出血性腦中風處置

- 控制顱內高壓
- 預防再出血



# 初步處置

- 良好通氣、組織灌流
- 控制血壓: SBP 160, MAP 130
- 控制血糖140-180
- 預防癲癇、鎮靜
- 避免發燒
- 降腦壓藥物 osmolarity agents

Clinical parameter	Recommendation
Airway and ventilation	Target pCO <sub>2</sub> : 4.7 – 5.9 kPa; Target pO <sub>2</sub> > 8kPa; Target SpO <sub>2</sub> 95–98%
Hemodynamics	Continuous monitoring of ECG and BP Monitor Treat cardiac arrhythmias, Avoid hypotension, tolerate initial transient hypertension Utilize isotonic fluid to maintain euvolemia. Target CPP 50–60 mmHg
Glucose target	Glucose 7.8 – 9.9 mmol/l (avoid hypoglycemia at all times)
Temperature	Maintain normothermia
Miscellaneous	Administer subcutaneous low-molecular-weight heparin for deep venous thrombosis prophylaxis or intermittent pneumatic compression No indication for seizure prophylaxis
Elevated ICP	Elevate head of bed to about 20-30°, keep neck straight to support venous return Start or increase analgesia and sedation Start mechanical ventilation Apply hyperventilation, but only short term Treat seizures, fever, hyperglycemia, respiratory distress, etc. if present Consider osmotherapy Consider barbiturates Consider muscle relaxation

*BP indicates blood pressure; CPP, cerebral perfusion pressure; ECG, electrocardiography; kPa, kilopascal; ICP, intracranial pressure; pCO<sub>2</sub>, partial pressure of carbon dioxide; SpO<sub>2</sub>, peripheral oxygenated saturation.*

# 外科醫師於出血性腦中風的腳色

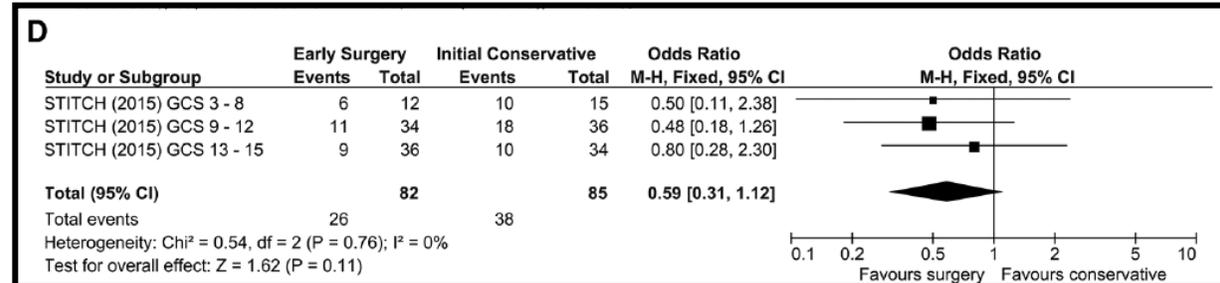
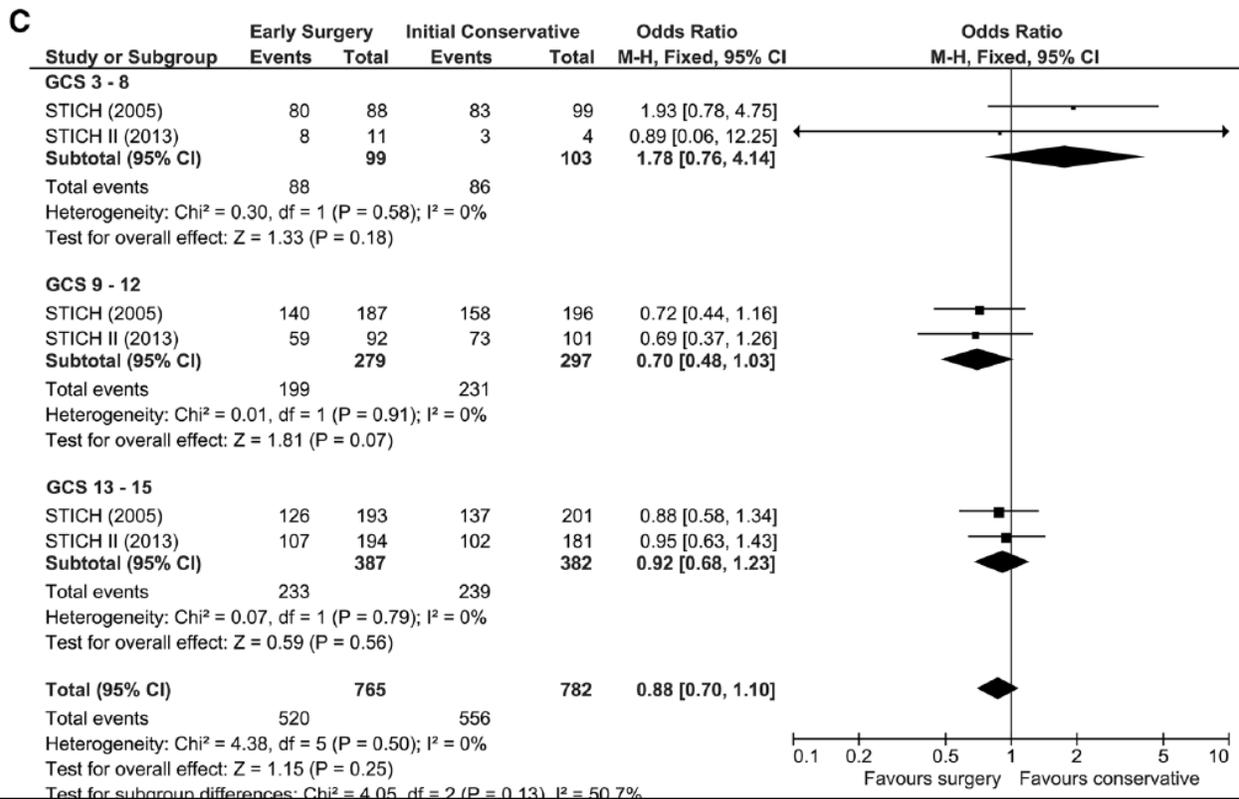
OPEN

## Surgical Decision Making in Brain Hemorrhage New Analysis of the STICH, STICH II, and STITCH(Trauma) Randomized Trials

Barbara A. Gregson, PhD; Patrick Mitchell, FRCS; A. David Mendelow, FRCS(SN)

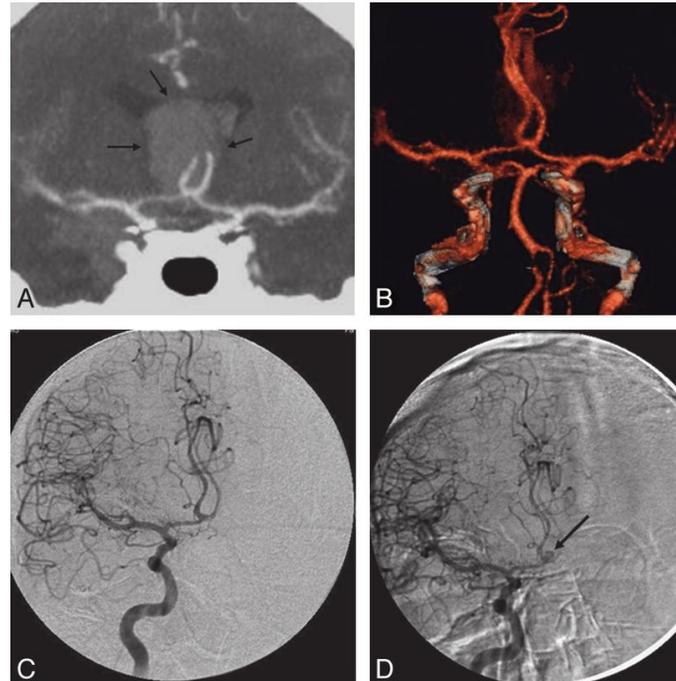
CME Available

- 及早手術:
- 結論一: 13 > GCS > 10分有助於存活率及功能性
- 結論二: 整體而言提升存活率, 但功能性預後則無明顯差異



# 蛛網膜(SAH)下腔出血(動脈瘤)

- Control BP
- 若病人意識清醒:  
⇒ Arrange brain CTA
- 若病人昏迷合併水腦症/腦室內出血(IVH):  
⇒ 會診神外進行腦室外引流(EVD)



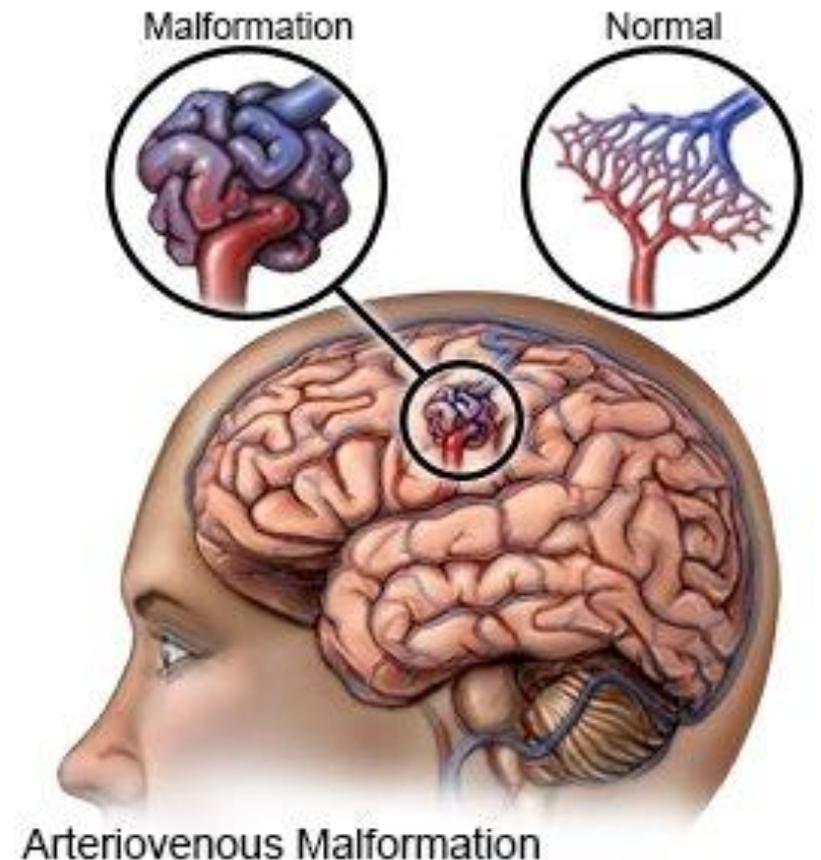
# 神經外科醫師於蛛網膜下腔出血(動脈瘤)的角色-

- 治療目標：預防再次出血;處理出血後併發症。
- 外科手術：
  - 1.腦內出血: 移除血腫。
  - 2.急性水腦症:腦室外引流(EVD)
  - 3.夾閉(clipping)動脈瘤手術
  - 4.栓塞手術(embolization)
- 臨床上最常見的併發症及治療:
  1. 慢性水腦症:腦室腹腔引流管 (VP shunt)
  2. 血管痙攣: Ca channel blocker; angioplasty
  3. 癲癇
  4. 低血鈉

# 特殊型態的腦出血

## 動靜脈畸形(Arteriovenous malformation)

- 可能出現的併發症及治療方式
  - 1.腦內出血: 移除血腫及動脈瘤
  - 2.急性水腦症: 腦室外引流
  - 3.癲癇: 移除病灶處動靜脈畸形，增進癲癇控制率
- 其他治療方式: 栓塞、加馬刀(gamma knife)、手術移除



感謝聆聽