NEURO 2009

Reunião conjunta da SPNC e SPN

TERAPÊUTICA CIRÚRGICA DO ENFARTE ISQUÉMICO CRANIECTOMIA DESCOMPRESSIVA

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Algarve, Maio 2009

craniectomia descompressiva

craniectomia descompressiva

Respostas definitivas

que patologias

quem beneficia

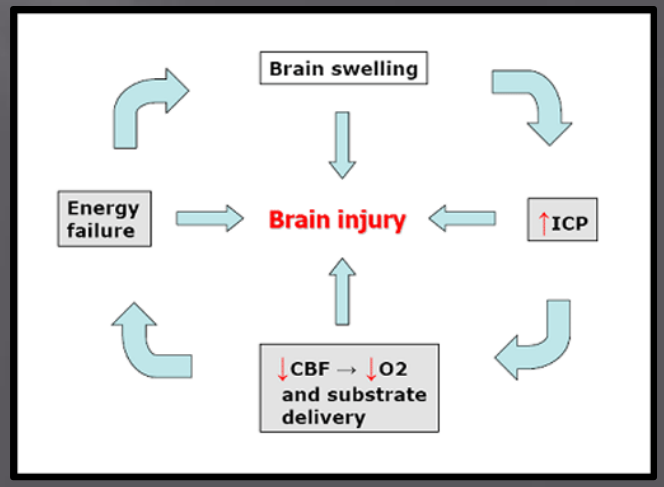
quando operar

melhor procedimento (op e pós-op)

craniectomia descompressiva

Fisiopatologia

edema
aumento da PIC
redução da irrigação sanguínea
hipoxia
alt. metabolismo energético
edema



craniectomia descompressiva

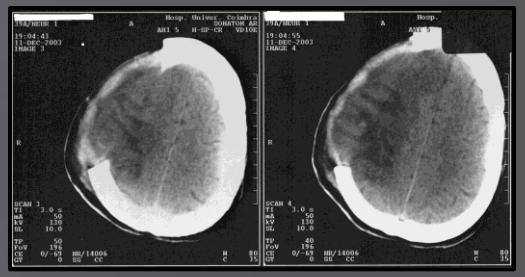
Objectivo

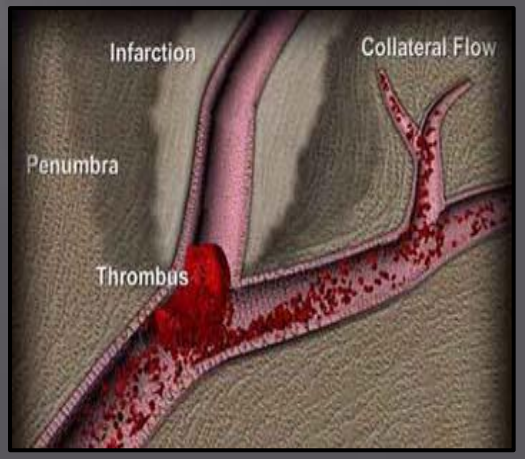
herniação interna > externa

redução da PIC (↑ PPC)

melhorar perfusão cerebral (FSC)

promover circulação colateral





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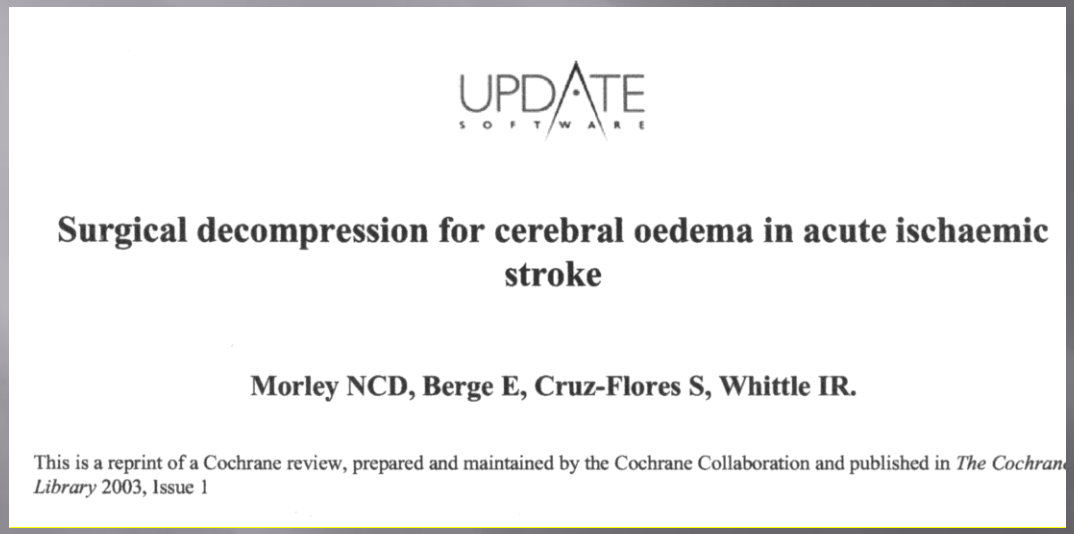


UPDATE SOFTWARE

Surgical decompression for cerebral oedema in acute ischaemic stroke

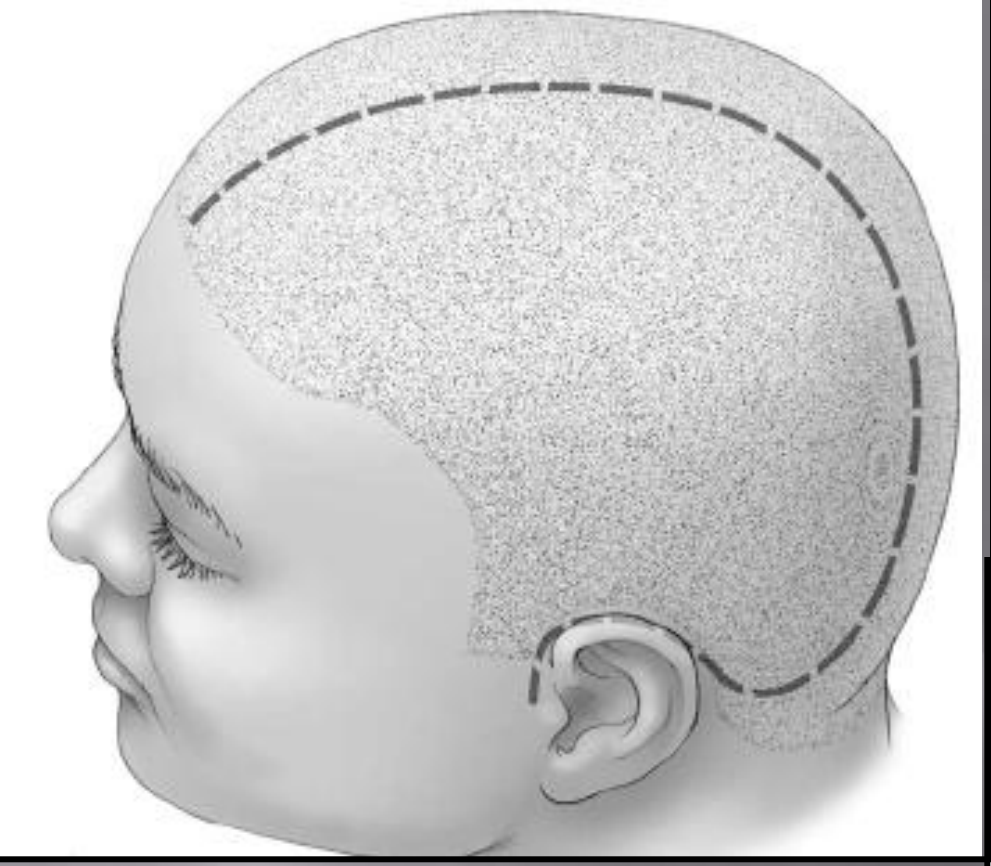
Morley NCD, Berge E, Cruz-Flores S, Whittle IR.

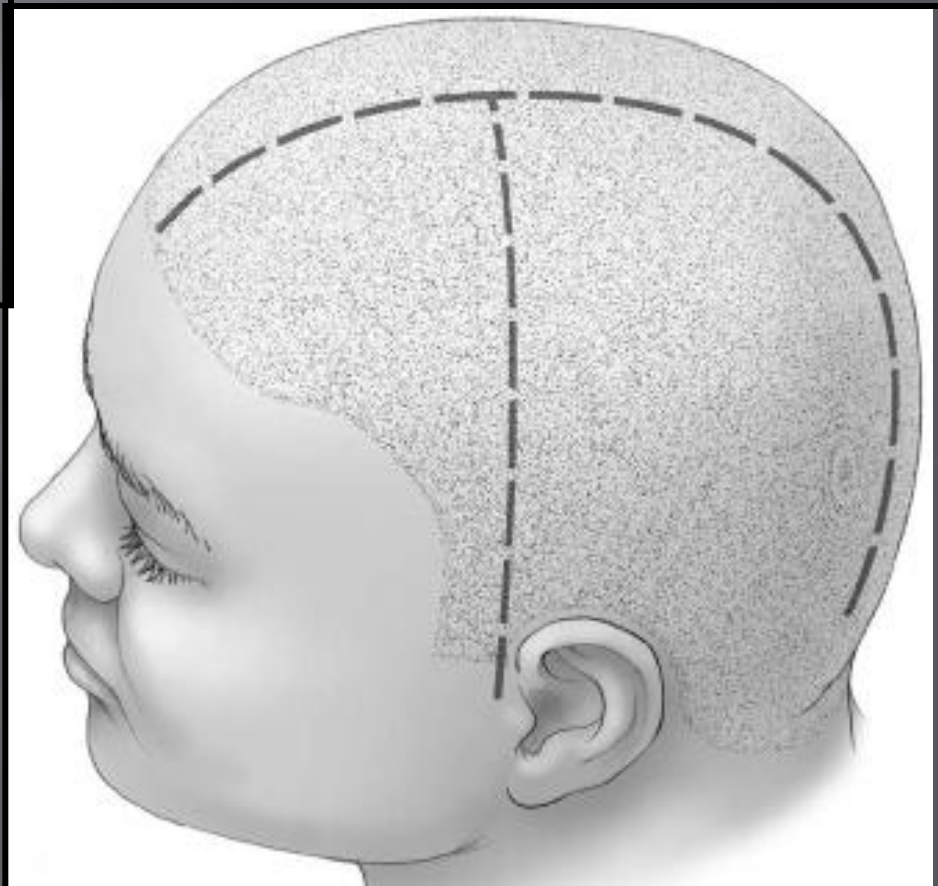
This is a reprint of a Cochrane review, prepared and maintained by the Cochrane Collaboration and published in *The Cochrane Library* 2003, Issue 1

the cochrane library

"não há evidência de estudos randomizados…."

- DESTINY, HAMLET, DECIMAL, HeaDDFIRST, HeMMI





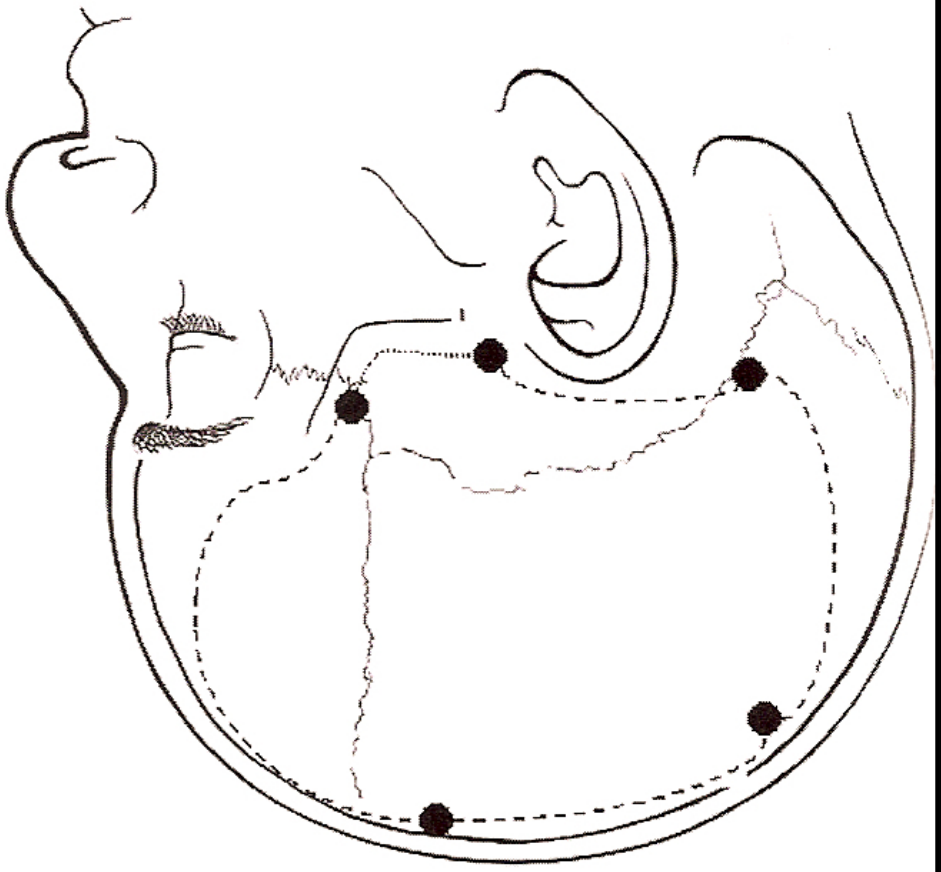
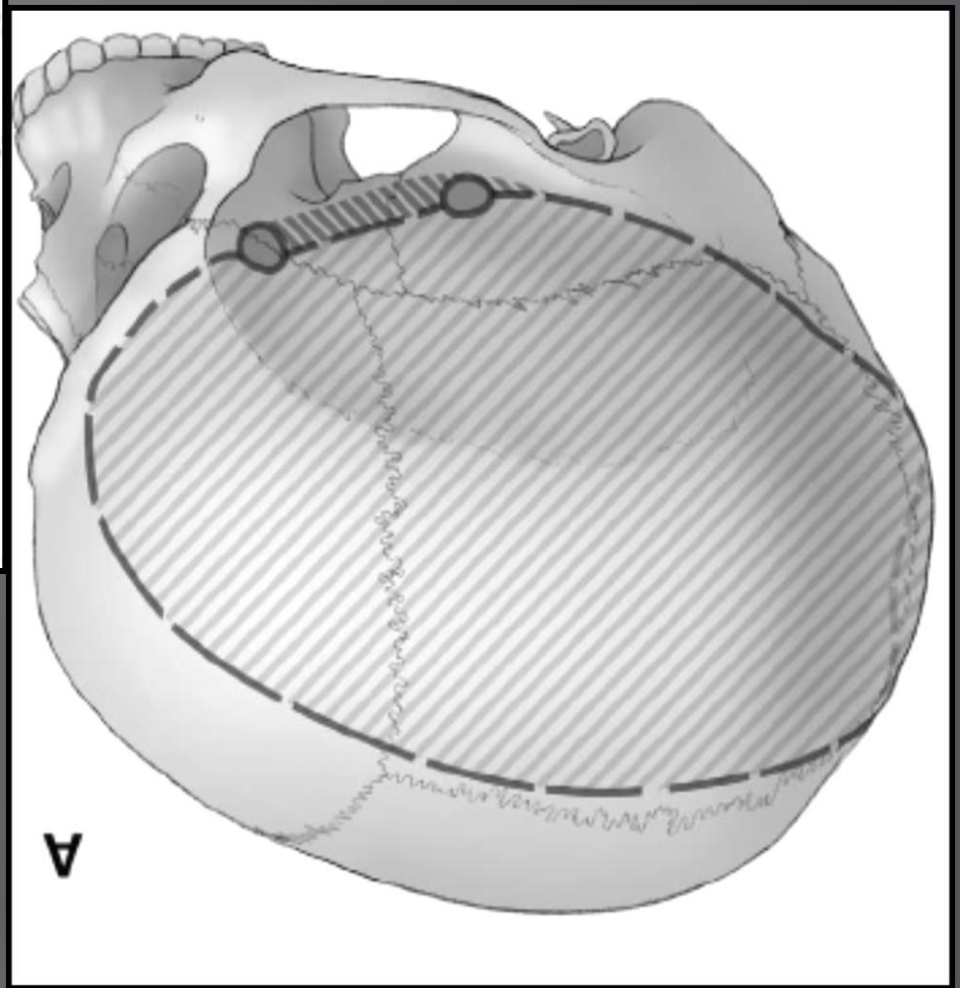
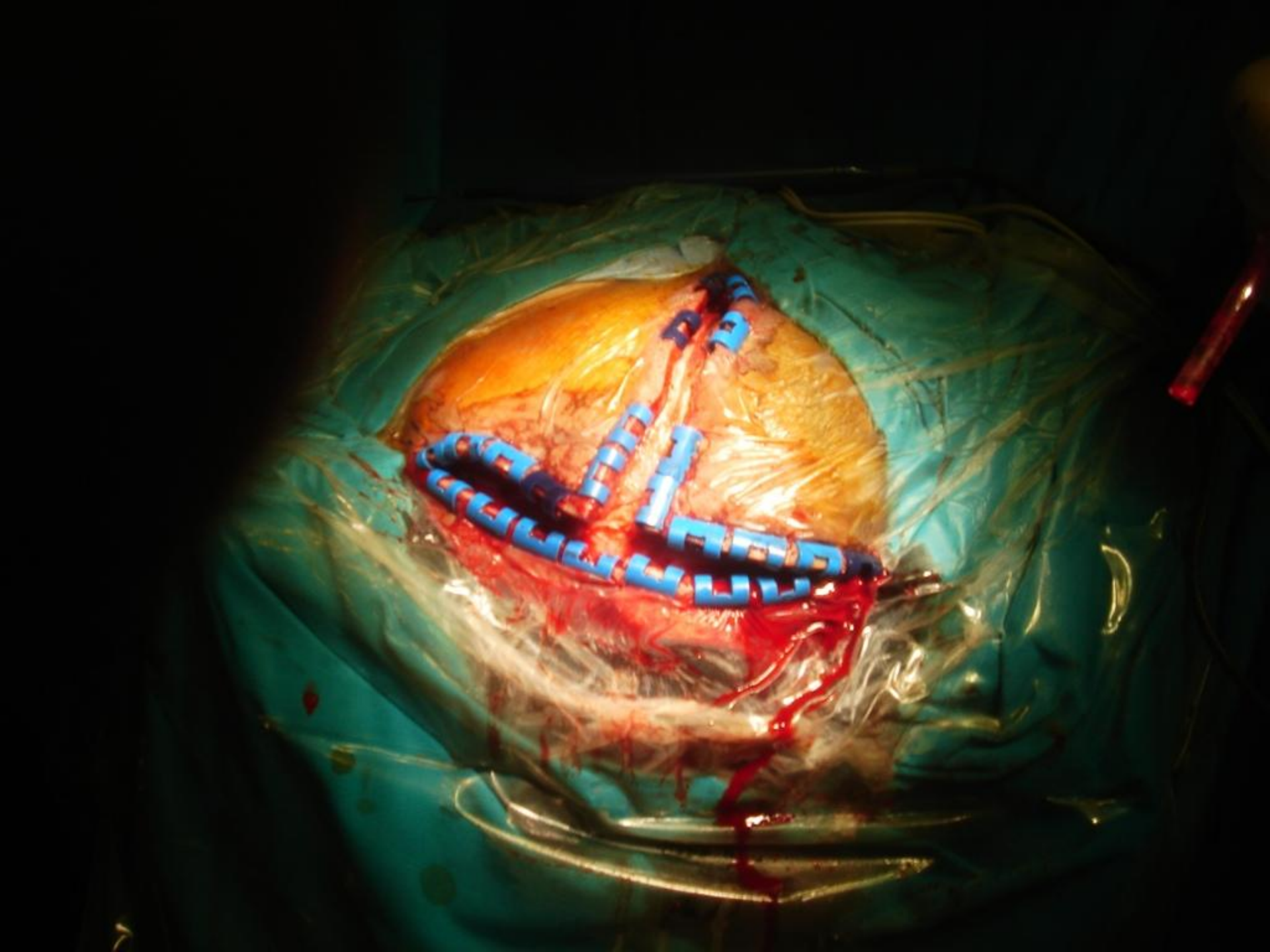
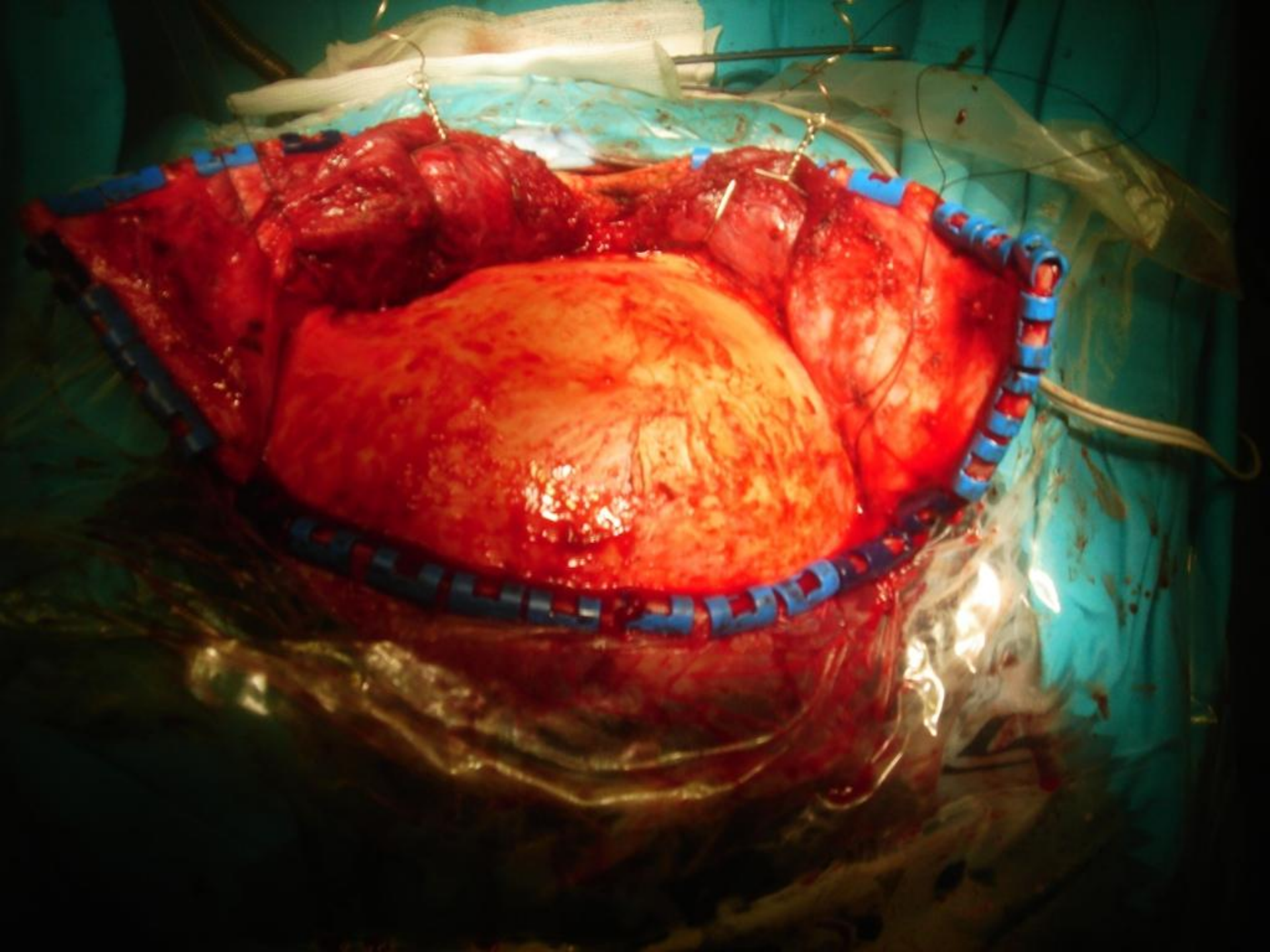
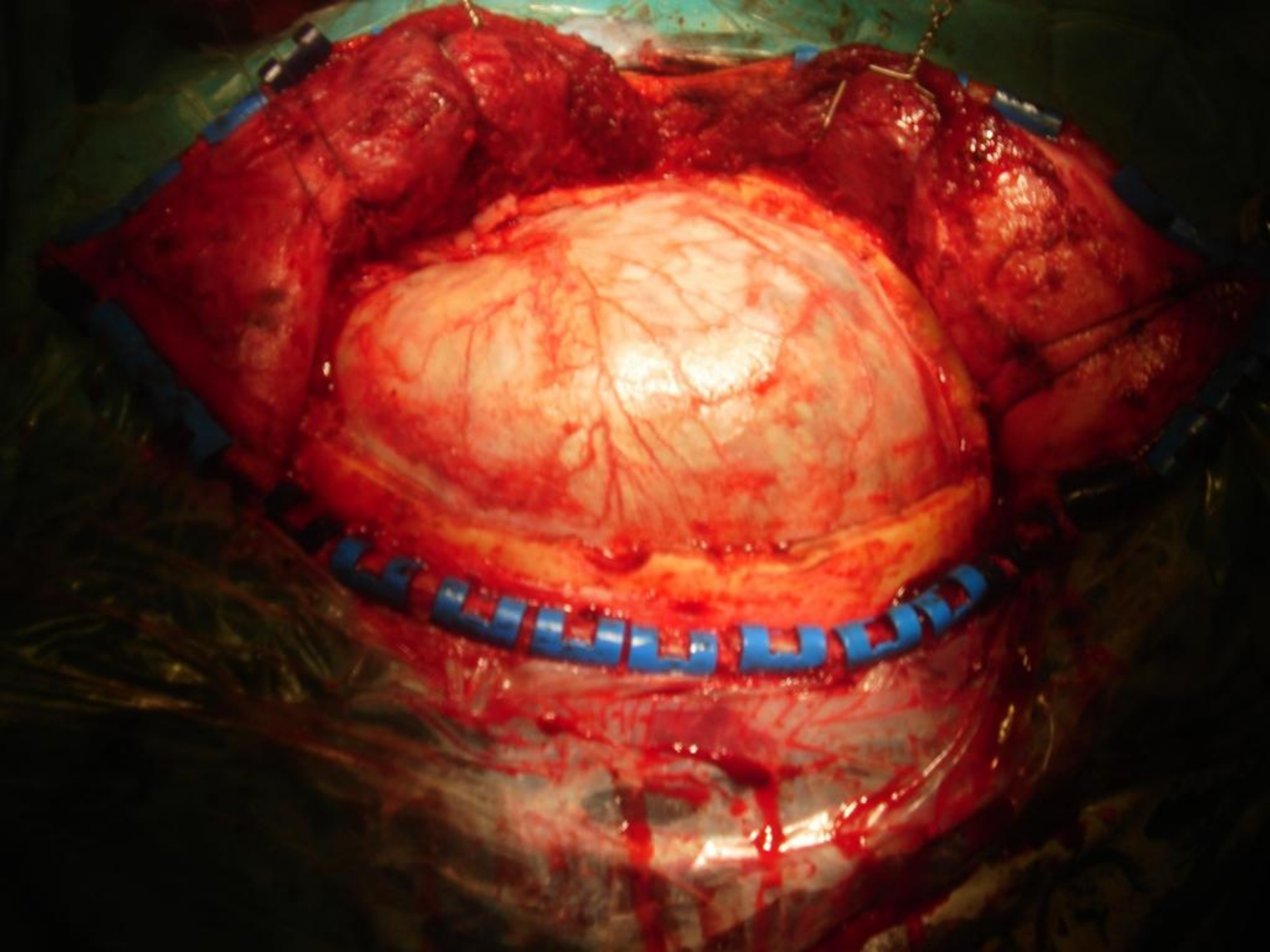


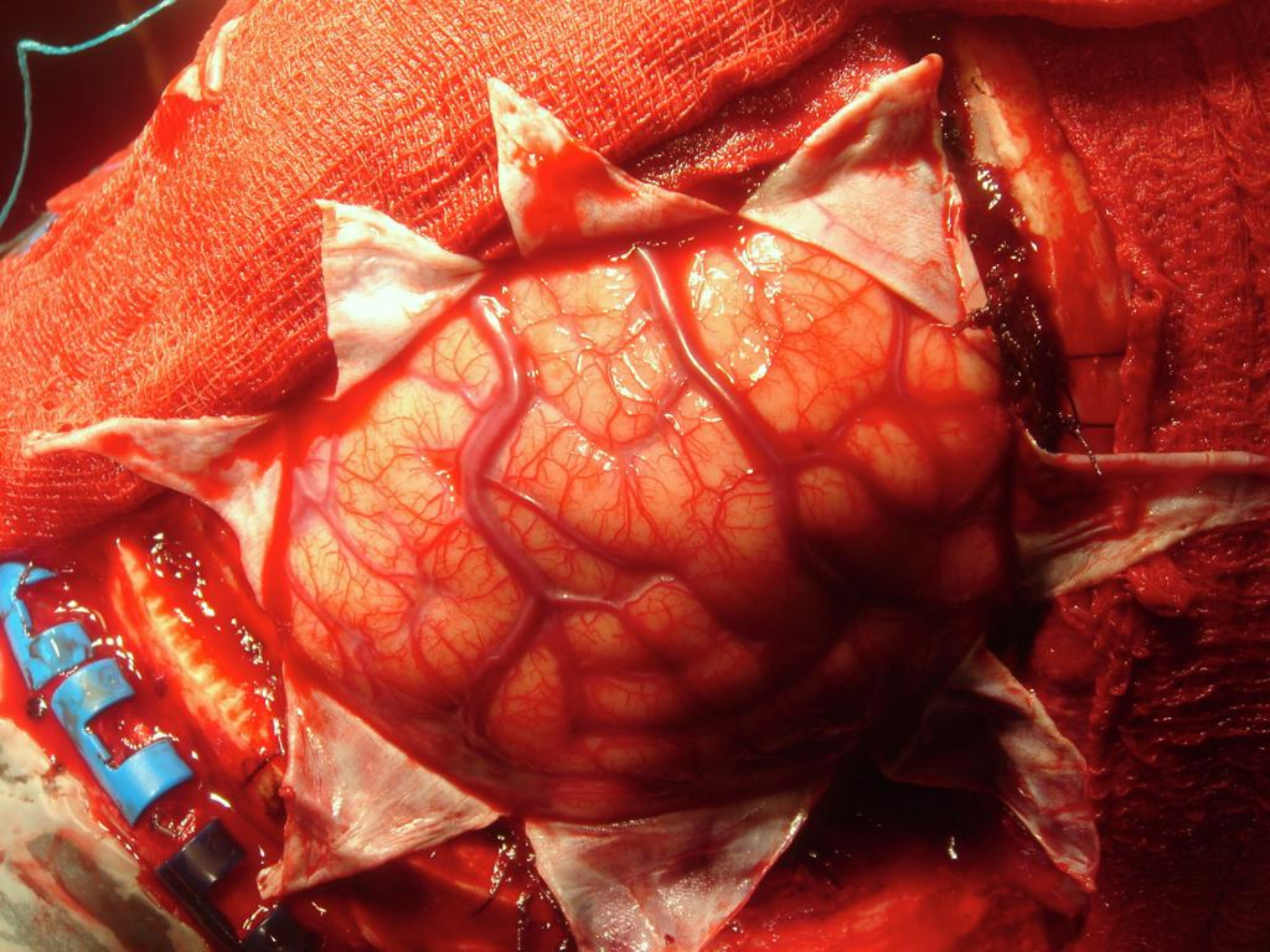
FIGURE 5-3 Hemicraniectomy. The skin incision can be in th

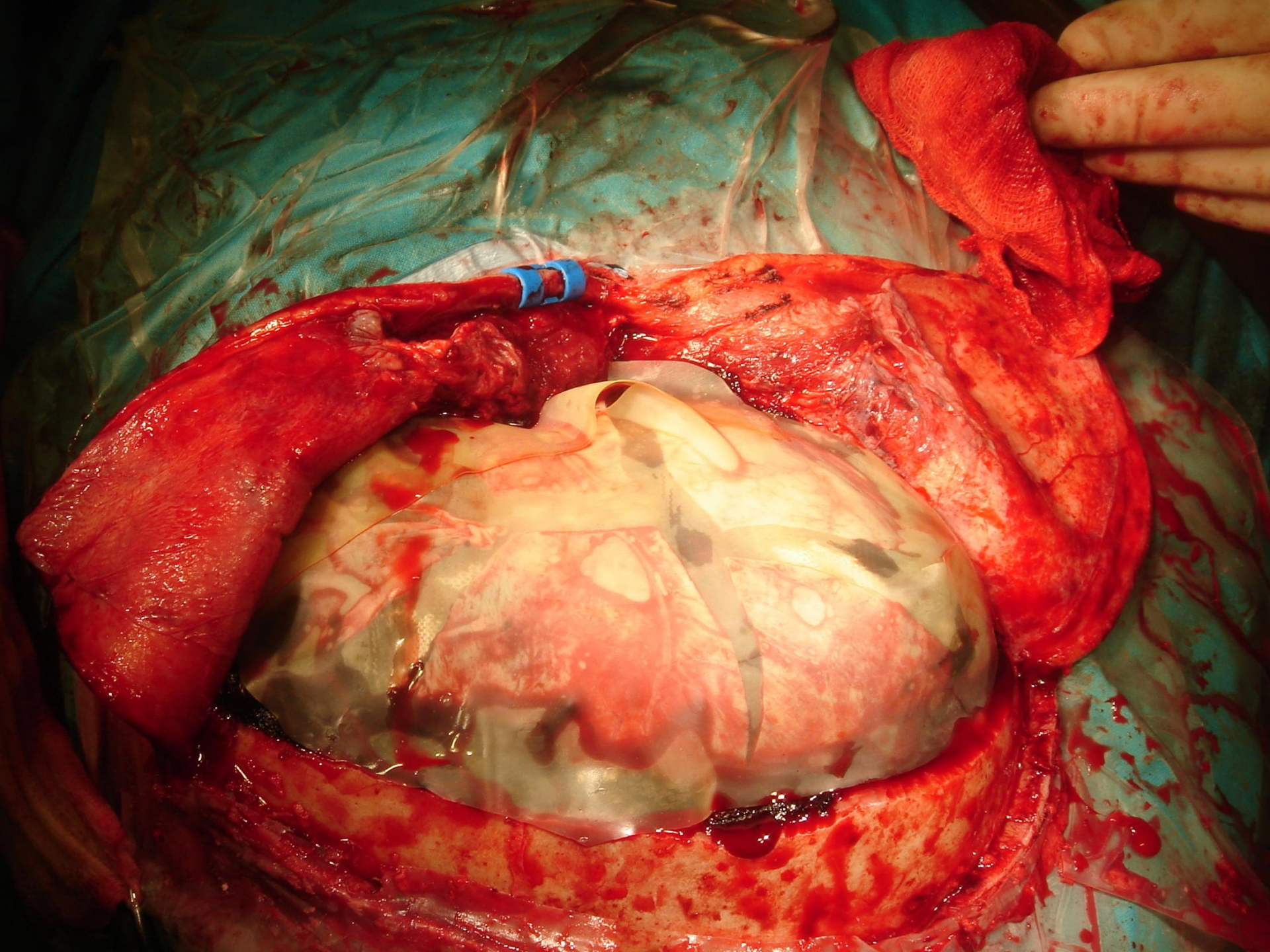


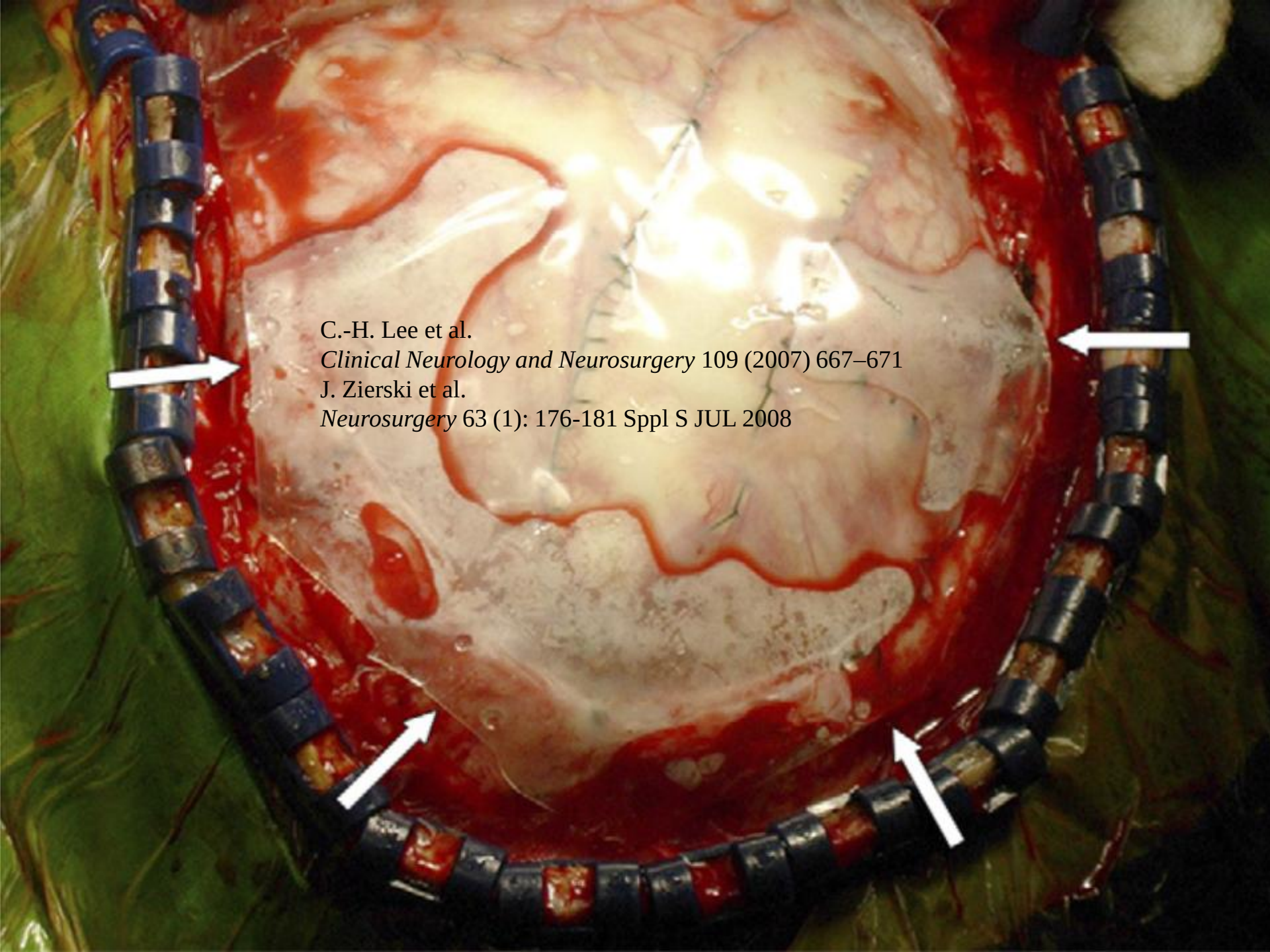




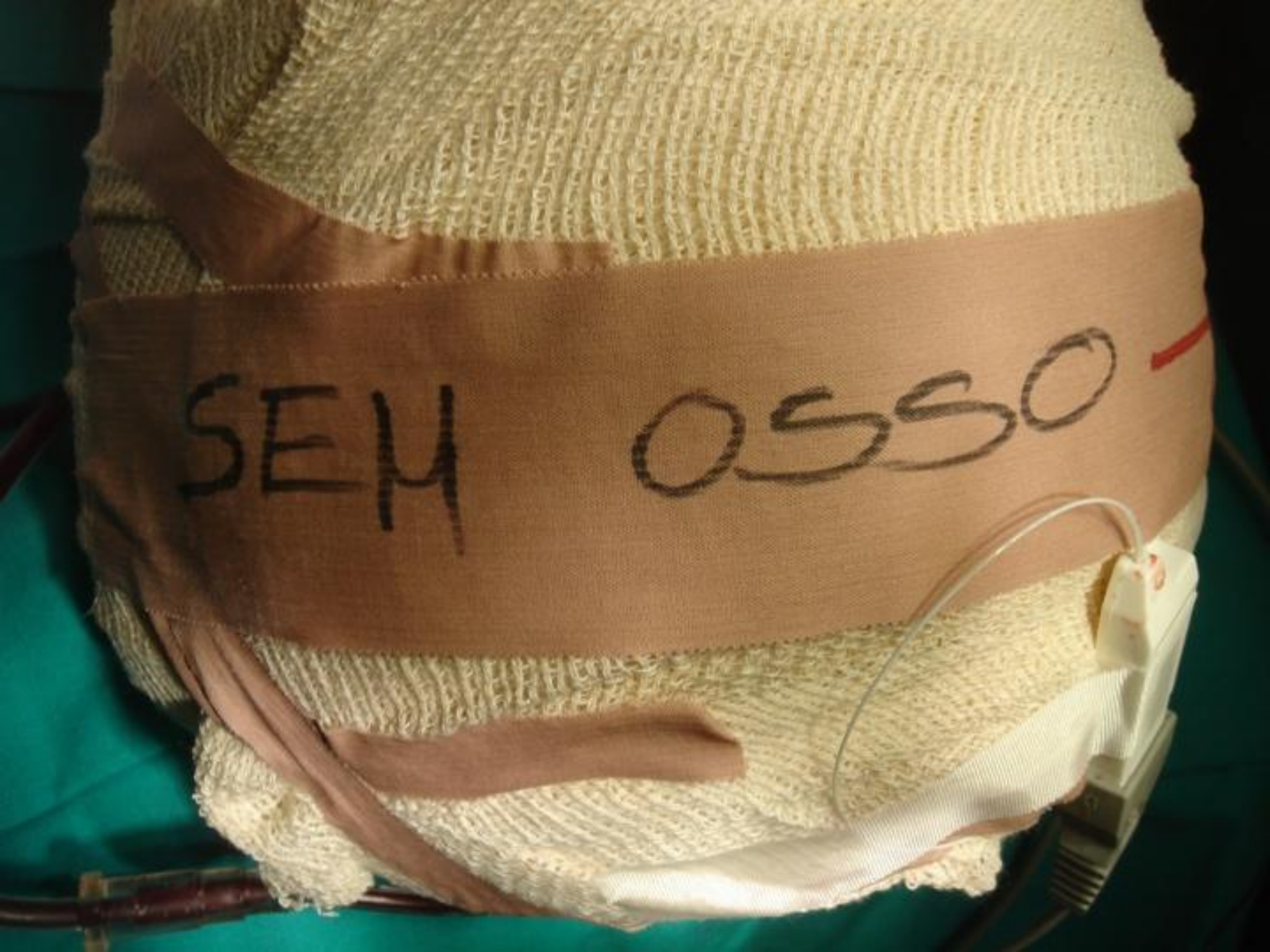








C.-H. Lee et al.
Clinical Neurology and Neurosurgery 109 (2007) 667–671
J. Zierski et al.
Neurosurgery 63 (1): 176-181 Sppl S JUL 2008


SEM OSSO

CRANIECTOMIA DESCOMPRESSIVA

COMPLICAÇÕES

- hematomas intracerebrais (3-40%) (90%)
- enfartes (28%)
- colecções extra-axiais (20%; 5%)
- fístulas de LCR (3-5%)
- epilepsia (5-30%)
- hidrocefalia (5-30%)
- falência da cranioplastia (2-6%)

CRANIECTOMIA DESCOMPRESSIVA

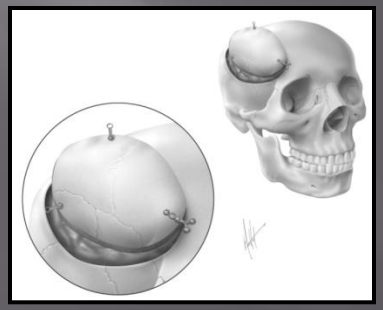
SINDROME DO TREFINADO

- regressão do estado neurológico semanas a meses, após uma melhoria inicial, que se acompanha de uma depressão no sítio da retalho
- cefaleias, tonturas, náuseas, zumbidos, hemiparesia/hipoalgesia, disfasia, apraxia, alteração da consciência e problemas de memória
- diferencial de pressão do LCR, alterações hemodinâmicas (FSC), da drenagem venosa e da função metabólica
- melhora com reposição do retalho

craniectomia descompressiva

CONSERVAÇÃO OSSO

- autóloga
  - subcutâneo abdominal
  - subgaleal contralateral
  - "charneira" (hinge)
- criopreservação
- frigorífico
- óxido etileno



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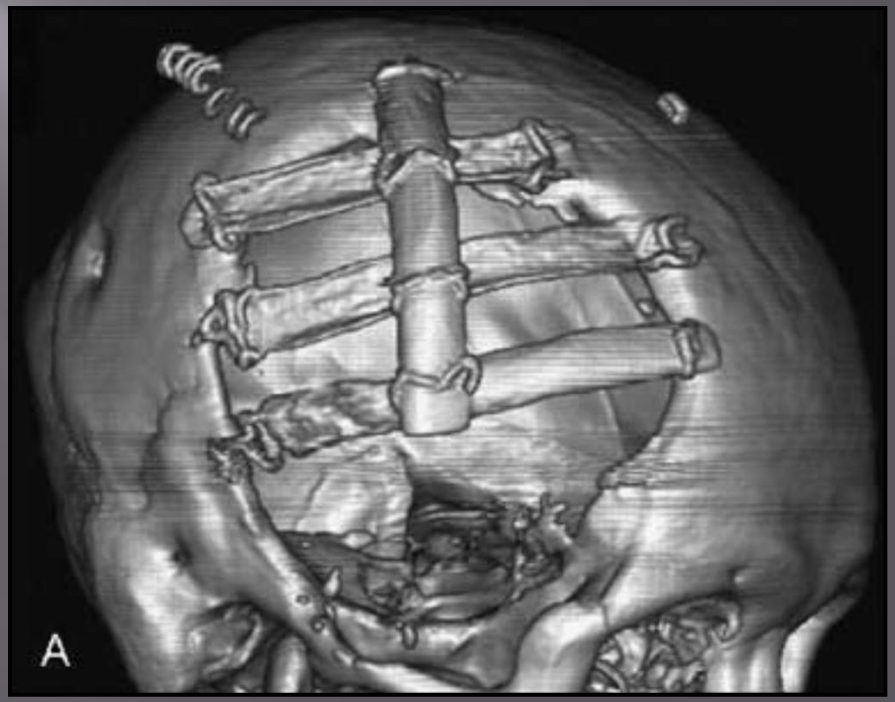
ALTERNATIVAS

- malha de titânio
- metacrilato
- sintética CT
- costela
- split-thickness



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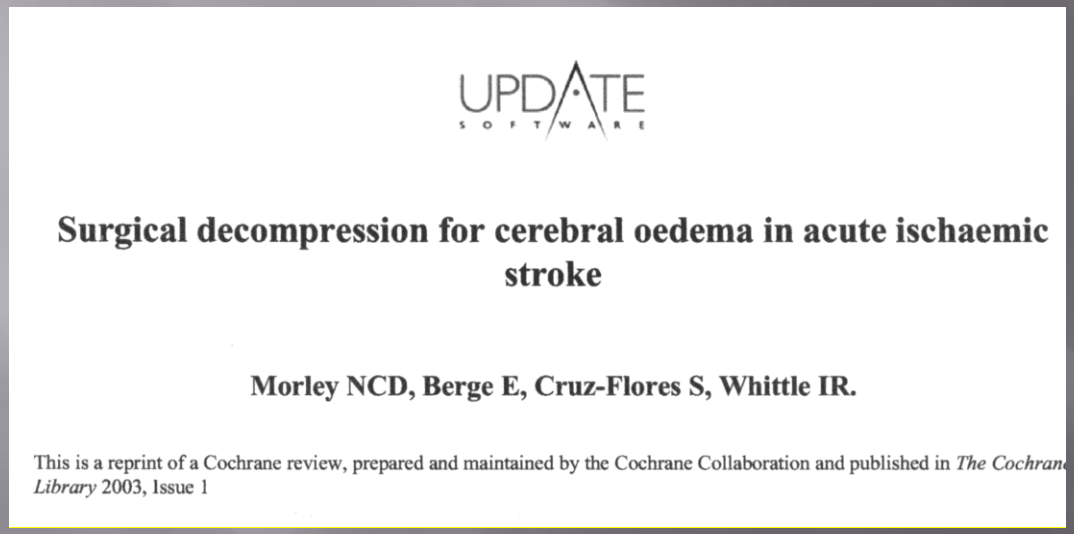

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Outcome and prognostic factors of hemicraniectomy for space occupying cerebral infarction

E Uhl, et al *Journal of Neurology Neurosurgery and Psychiatry* 2004;**75**:270-274

Results: The unadjusted 3, 6, and 12 month mortality rates were 7.9%, 37.6%, and 43.8%, respectively (median follow up, 26 weeks). In the "best" multivariate model**, age >50 years (p<0.02) and the involvement of two or more additional vascular territories (p<0.01) had an unfavourable impact on length of survival**. The adjusted six month mortality was as low as 20.0% (no risk factor) and as high as 59.7% (two risk factors). A GOS score of 3 was significantly associated with age >50 years (p<0.0003): 34.9% of the patients 50 years of age achieved a GOS score of >3, as compared with 12.0% of the elderly subpopulation. The side of the infarct did not have prognostic relevance.

Conclusions: Results of surgical treatment in patients **<50 years** of age undergoing decompressive craniectomy are encouraging. The effectiveness of decompressive craniectomy for patients >50 years remains questionable and should be analysed in the framework of a prospective randomised study.

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Hemicraniectomy for Massive Middle Cerebral Artery Territory Infarction. A Systematic Review

Rishi Gupta et al. *Stroke* 2004;35:539-543

Results— Of 15 studies screened, 12 studies describing 129 patients met the criteria for analysis; 9 patients treated at our institution were added, for a total of 138 patients. After a minimum follow-up of 4 months, 10 patients (7%) were functionally independent, 48 (35%) were mildly to moderately disabled, and 80 (58%) died or were severely disabled. Of 75 patients who were **>50 years of age, 80% were dead or severely disabled compared with 32% of 63 patients 50 years of age (P<0.00001).** The timing of surgery, hemisphere infarcted, presence of signs of herniation before surgery, and involvement of other vascular territories did not significantly affect outcome.

Conclusions— **Age** may be a **crucial factor** in predicting functional outcome after hemicraniectomy in patients with large middle cerebral artery territory infarction.

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- DECIMAL (França)
- DESTINY (Alemanha)
- HAMLET (Holanda)

- Pooled analysis
  (Lancet, Neurology Março 2007)

- HeMMI (Filipinas)
- HeaDDFIRST (EUA)

craniectomia descompressiva

Early decompressive surgery in malignant infarction of the middle cerebral artery: a pooled analysis of three randomised controlled trials

Katayoun Vahedi, Jeannette Hofmeijer, Eric Juettler, Eric Vicaut, Bernard George, Ale Algra, G Johan Amelink, Peter Schmiedeck, Stefan Schwab, Peter M Rothwell, Marie-Germaine Bousser, H Bart van der Worp, Werner Hacke, for the DECIMAL, DESTINY, and HAMLET investigators

Summary

Background Malignant infarction of the middle cerebral artery (MCA) is associated with an 80% mortality rate. Non-randomised studies have suggested that decompressive surgery reduces this mortality without increasing the number of severely disabled survivors. To obtain sufficient data as soon as possible to reliably estimate the effects of decompressive surgery, results from three European randomised controlled trials (DECIMAL, DESTINY, HAMLET) were pooled. The trials were ongoing when the pooled analysis was planned.

Methods Individual data for patients aged between 18 years and 60 years, with space-occupying MCA infarction, included in one of the three trials, and treated within 48 h after stroke onset were pooled for analysis. The protocol was designed prospectively when the trials were still recruiting patients and outcomes were defined without knowledge of the results of the individual trials. The primary outcome measure was the score on the modified Rankin scale (mRS) at 1 year dichotomised between favourable (0–4) and unfavourable (5 and death) outcome. Secondary outcome measures included case fatality rate at 1 year and a dichotomisation of the mRS between 0–3 and 4 to death. Data analysis was done by an independent data monitoring committee.

Findings 93 patients were included in the pooled analysis. More patients in the decompressive-surgery group than in the control group had an mRS≤4 (75% *vs* 24%; pooled absolute risk reduction 51% [95% CI 34–69]), an mRS≤3 (43% *vs* 21%; 23% [5–41]), and survived (78% *vs* 29%; 50% [33–67]), indicating numbers needed to treat of two for survival with mRS≤4, four for survival with mRS≤3, and two for survival irrespective of functional outcome. The effect of surgery was highly consistent across the three trials.

Interpretation In patients with malignant MCA infarction, decompressive surgery undertaken within 48 h of stroke onset reduces mortality and increases the number of patients with a favourable functional outcome. The decision to perform decompressive surgery should, however, be made on an individual basis in every patient.

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Panel: Eligibility criteria for the pooled analysis

Inclusion criteria

Age 18–60 years

Clinical deficits suggestive of infarction in the territory of the MCA with a score on the National Institutes of Health stroke scale (NIHSS) >15

Decrease in the level of consciousness to a score of 1 or greater on item 1a of the NIHSS

Signs on CT of an infarct of at least 50% of the MCA territory, with or without additional infarction in the territory of the anterior or posterior cerebral artery on the same side, or infarct volume >145 cm^3 as shown on diffusion-weighted MRI

Inclusion within 45 h after onset of symptoms

Written informed consent by the patient or a legal representative

Exclusion criteria

Prestroke score on the mRS ≥2

Two fixed dilated pupils

Contralateral ischaemia or other brain lesion that could affect outcome

Space-occupying haemorrhagic transformation of the infarct (≥parenchymal haemorrhage grade 2)

Life expectancy <3 years

Other serious illness that could affect outcome

Known coagulopathy or systemic bleeding disorder

Contraindication for anaesthesia

Pregnancy

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The present study shows that after decompressive surgery the probability of survival increases from 28% to nearly 80% and the probability of survival with an mRS of ≤3 doubles. However, the probability of surviving in a condition requiring assistance from others (mRS of 4) increases more than ten times, although the risk of very severe disability (mRS of 5) is not increased. The choice of performing decompressive surgery in an individual patient with space-occupying hemispheric infarction will therefore depend on the willingness to accept survival with moderate disability. Information about quality of life of survivors is essential for guiding such decisions. Previous studies on quality of life after decompressive surgery for space-occupying infarction have reported divergent results.[21-23] Even patients with aphasia may improve significantly.[24]

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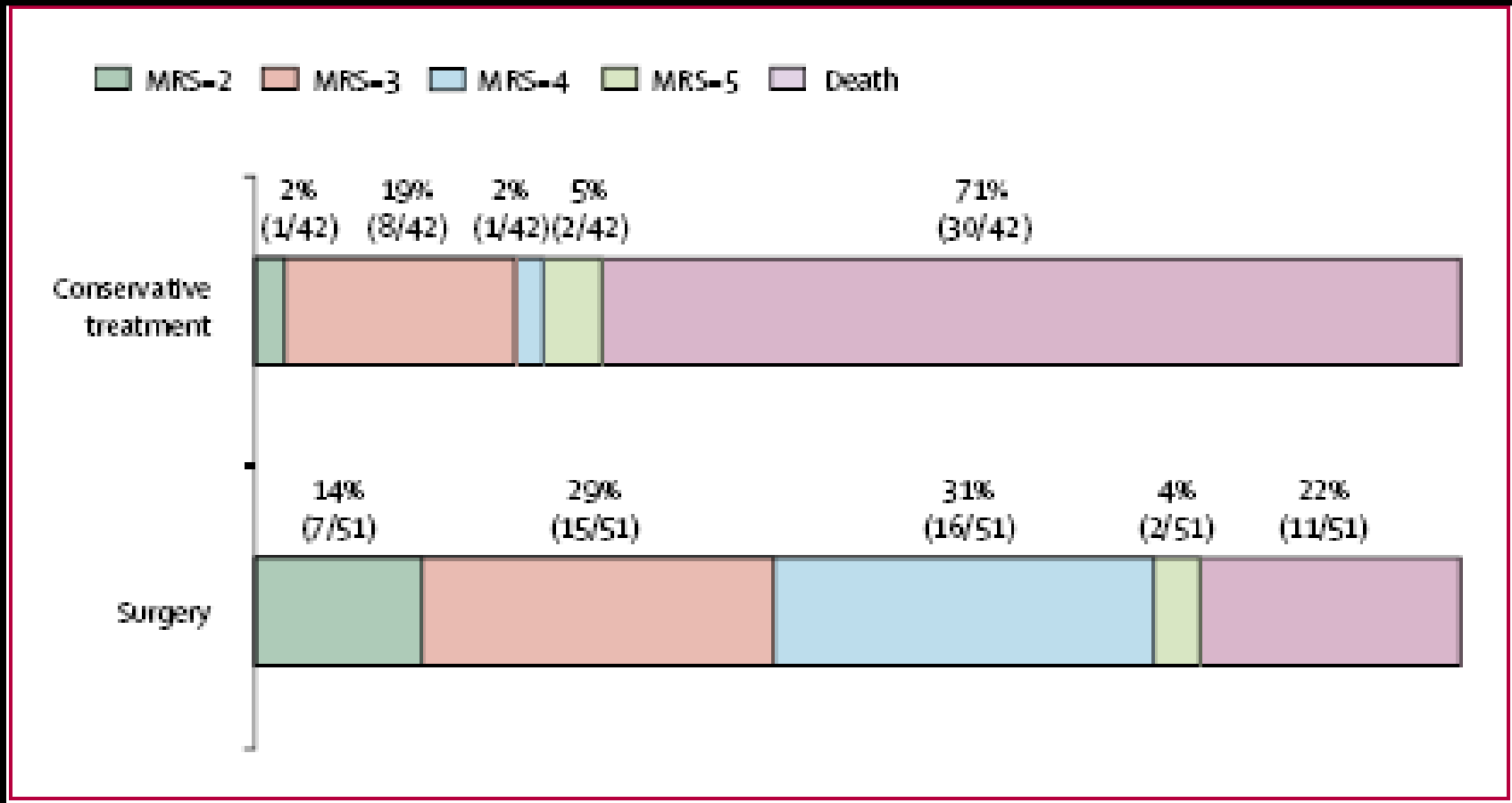

Figure 1: Distributions of the scores on the mRS and death after 12 months for patients treated with or without decompressive surgery

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- A decisão de operar deve ser sempre tomada por acordo entre o Neurologista e o Neurocirurgião, pelo que o envolvimento deste último no processo deve ser o mais precoce possível, logo a partir do diagnóstico de enfarte maligno.

- Factores a considerar para essa decisão são o intervalo de tempo entre o AVC e a possibilidade de efectuar a cirurgia, a idade, a lateralidade, a extensão do enfarte (> 50% do território ou > 145cc na RM de difusão) e o envolvimento de território arterial adicional (contra-indicação se contra-lateral), a transformação hemorrágica, o estado clínico, a existência de co-morbilidade e a opção do doente e/ou da sua família, dado que existe ainda um risco que a sobrevivência seja à custa de uma incapacidade grave.

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- critérios clínicos de diagnóstico:
  hemiplegia (afasia), desvio óculo-cefálico…
  estado consciência…anisocória…coma

- critérios clínicos de previsibilidade:
  NIHSS ≥ 20 (6h)
  TAs ≥180 mmHg
  náuseas/vómitos
  ICC

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critérios imagiológicos TAC

	Especificidade	Sensibilidade
▪ Hipodensidade >67%	100 %	45.2 %
▪ Hipodensidade >50%	93.5 %	58.1 %
▪ Edema hemisférico	100 %	12.9 %
▪ Desvio linha média	96.7 %	19. 4%
▪ Hiperdensidade ACM	83.9 %	70.9 %
▪ Compressão espaço subaracnoideu	29 %	100 %
▪ Atenuação contraste cortico-medular	96.8 %	87.1 %
▪ *Extensão a outros territórios*		

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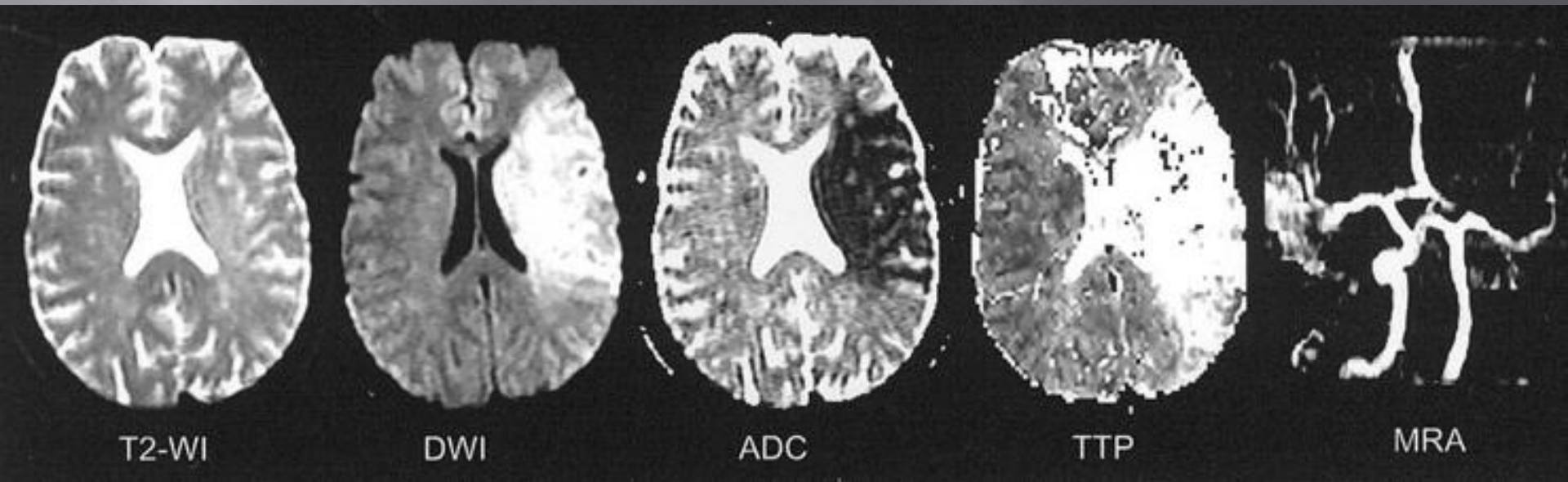
critérios imagiológicos

RM difusão/perfusão



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- RM difusão

área de enfarte > 89% = desenvolvimento edema maligno

(90% sensibildade, 96% especificidade)

enfartes < 145ml; > 210ml

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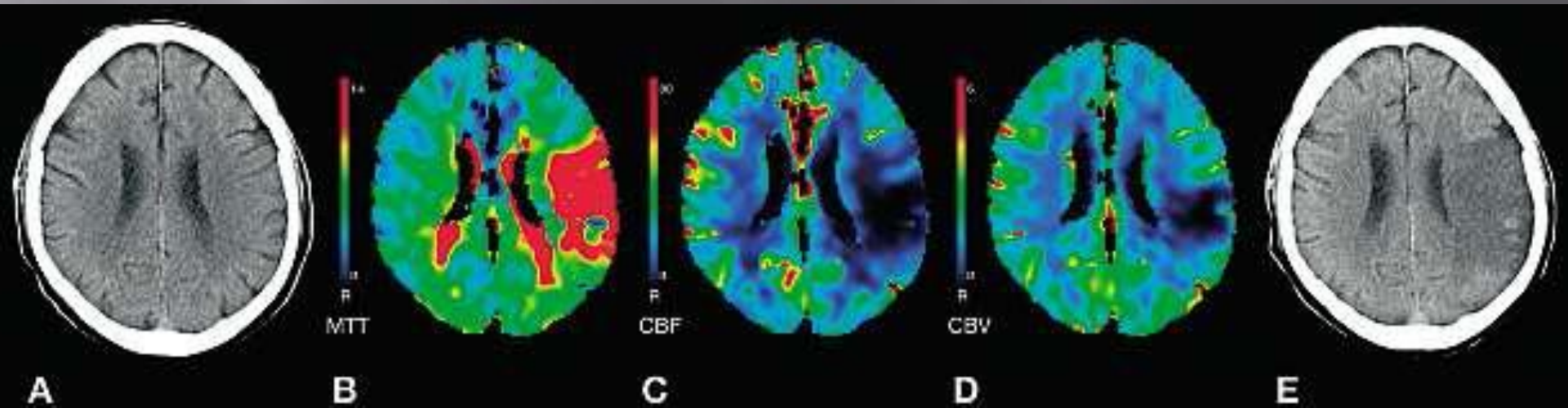
critérios imagiológicos

TAC perfusão



craniectomia descompressiva

Predictors of Life-Threatening Brain Edema in Middle Cerebral Artery Infarction

Jeannette H et al *Cerebrovasc Dis* 2008;25:176–184

Results: Infarct size was the major determinant of the development of life-threatening edema. Other associated determinants were early mass effect, involvement of other vascular territories, higher body temperature, internal carotid artery occlusion, and need for mechanical ventilation. However, predictive values were only moderate.

Conclusions: The **size of the ischemic area is the major determinant**. Single predictors lack sufficient predictive value to select candidates for surgical decompression before the onset of clinical signs of herniation.

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Limite de idade

- mortalidade
  idade ≤50 anos versus >50 anos (*p* =0.02)
  ACM versus ACM + adicional *(p =0.01)*

- morbilidade
  ≤50 anos GOS 1-2 = 34,9%
  >50 anos GOS 1-2 = 12% (*p <0.0003)*

(Uhl E et al, *J Neurol Neurosurg Psychiatry* 75:270-4, 2004)

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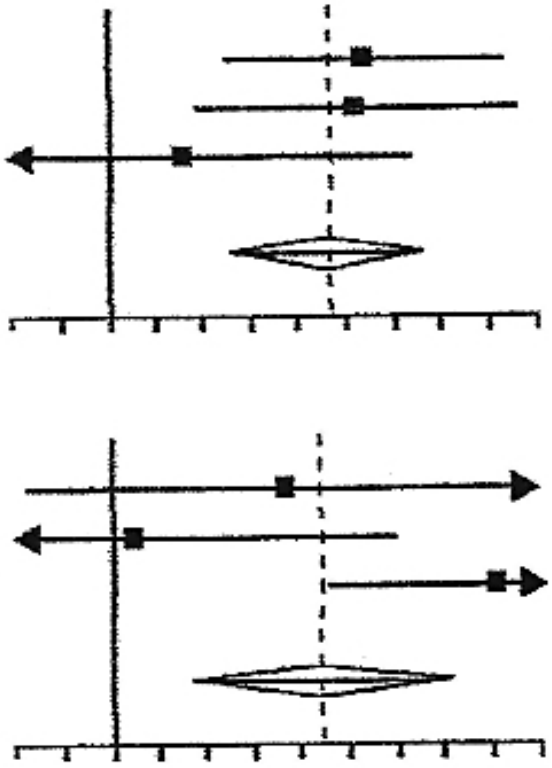
	Outcome/patients Conservative	Surgery	ARR (%)	95% CI	OR	95% CI
Age <50 years						
DECIMAL	11/15	3/16	54·6	25·1 to 84·0	0·08	0·02–0·46
DESTINY	6/10	1/13	52·3	18·7 to 86·0	0·06	0·01–0·61
HAMLET	5/6	4/6	16·7	−31·4 to 64·8	0·40	0·03–6·18
Total	22/31	8/35	46·9	26·7 to 67·0	0·10	0·03–0·35
Significance: p<0·0001						
Heterogeneity: p=0·39						
Age ≥50 years						
DECIMAL	3/3	2/4	37·5	−17·0 to 92·0	0·14	0·00–4·47
DESTINY	4/5	3/4	5·0	−50·0 to 60·0	0·75	0·03–17·51
HAMLET	3/3	0/8	81·9	46·2 to 117·6	0·01	0·00–0·51
Total	10/11	5/16	44·5	17·0 to 72·1	0·13	0·02–0·76
Significance: p=0·0015						
Heterogeneity: p=0·044						



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"Timming" da cirurgia

- 80% → 16% → 34,4 %
  melhoria dos resultados funcionais

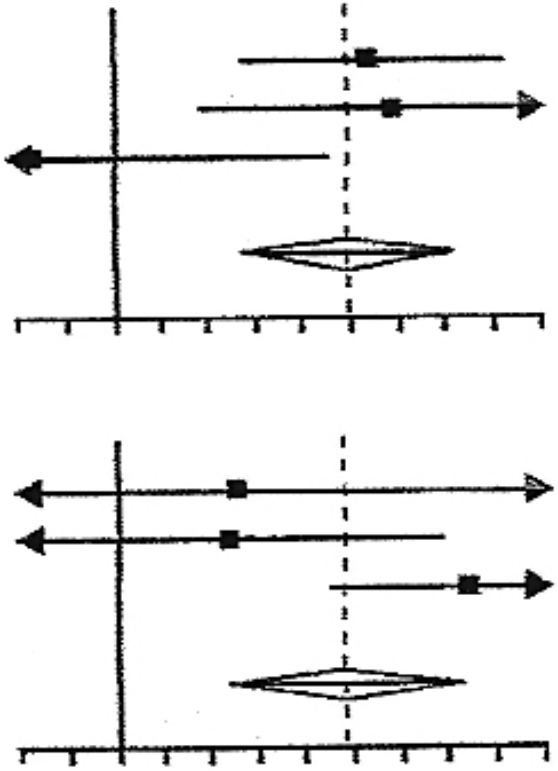
(Schwab S et al, *Stroke* 29:1888-93, 1998)

- cirurgia precoce com melhores resultados funcionais que cirurgia tardia (p <0.05)

(Mori K et al *Surg Neurol* 62:420-9, 2004)

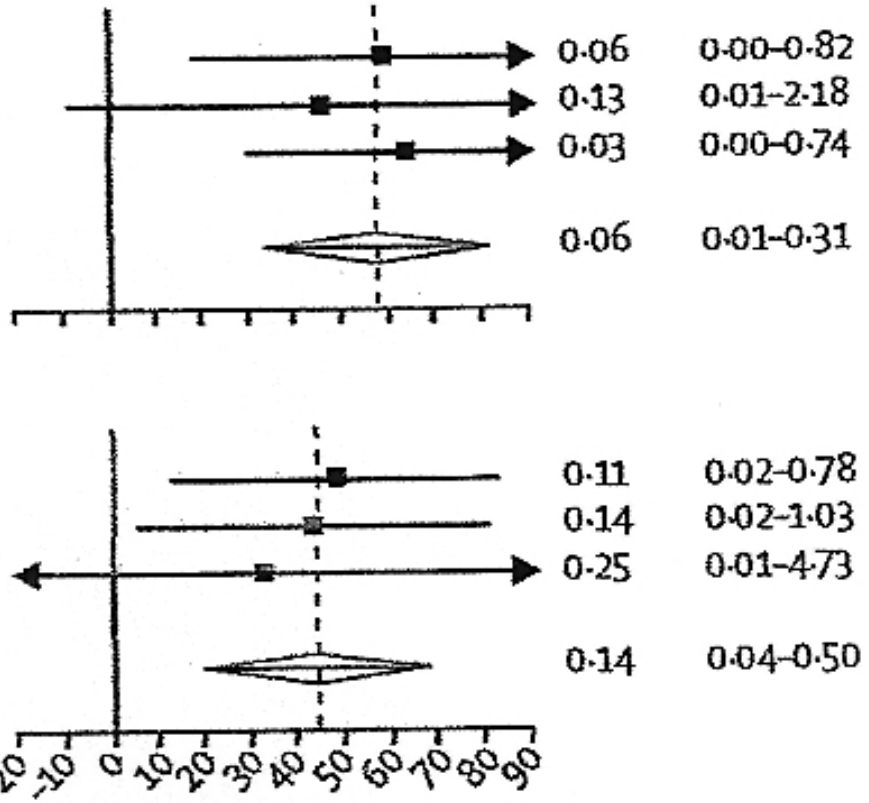
craniectomia descompressiva

	Outcome/patients Conservative	Surgery	ARR (%)	95% CI	OR	95% CI
Time to randomisation <24 h						
DECIMAL	13/16	5/19	54·9	24·7 to 82·5	0·08	0·02–0·42
DESTINY	7/8	2/7	58·9	18·4 to 99·5	0·06	0·00–0·82
HAMLET	1/2	2/3	−16·7	−104·1 to 70·8	2·00	0·05–78·25
Total	21/16	9/29	49·7	27·6 to 71·9	0·12	0·04–0·43
Significance: p=0·0002						
Heterogeneity: p=0·28						
Time to randomisation ≥24 h						
DECIMAL	1/2	0/1	25·0	−57·5 to 107·5	0·33	0·01–16·80
DESTINY	3/7	2/10	22·9	−21·4 to 67·1	0·33	0·04–2·87
HAMLET	7/7	2/11	72·9	44·5 to 101·4	0·02	0·00–0·42
Total	11/16	4/22	46·9	22·3 to 71·4	0·13	0·03–0·54
Significance: p=0·0002						
Heterogeneity: p=0·099						



craniectomia descompressiva

Outcome/patients	Conservative	Surgery	ARR (%)	95% CI	OR	95% CI
No aphasia						
DECIMAL	5/7	1/8	58·9	18·4 to 99·5	0·06	0·00–0·82
DESTINY	3/4	2/7	46·4	−7·6 to 100·5	0·13	0·01–2·18
HAMLET	6/6	2/8	65·1	30·1 to 100·0	0·03	0·00–0·74
Total	14/17	5/23	58·2	34·1 to 82·3	0·06	0·01–0·31
Significance: p<0·0001						
Heterogeneity: p=0·85						
Aphasia						
DECIMAL	9/11	4/12	48·5	13·4 to 83·6	0·11	0·02–0·78
DESTINY	7/11	2/10	43·6	5·9 to 81·4	0·14	0·02–1·03
HAMLET	2/3	2/6	33·3	−32·0 to 98·7	0·25	0·01–4·73
Total	18/25	8/28	44·2	20·2 to 68·1	0·14	0·04–0·50
Significance: p=0·0003						
Heterogeneity: p=0·92						



craniectomia descompressiva

Factors affecting the outcome of decompressive craniectomy for large hemispheric infarctions

Kilincer C, et al. *Acta Neurochir* (Wien). 2005 Jun;147(6):587-94

Enfarte no **hemisfério dominante não deve ser factor de exclusão** para cirurgia.

A **cirurgia precoce** num doente cuidadosamente seleccionado com base em factores pré-definidos pode **melhorar o seu resultado funcional**

craniectomia descompressiva

Decompressive craniectomy for ischemic stroke
Matsuura D, et al. *No To Shinkei*. 2006 Apr;58(4):305-10

No grupo dos **bons resultados** havia mais frequentemente lesões no **hemisfério dominante** do que no grupo com maus resultados
(p = 0.029)

Necessidade de avaliação dos parâmetros da **qualidade de vida e graus de satisfação**

craniectomia descompressiva

Quality of life after decompressive craniotomy in patients suffering from supratentorial brain ischemia

Woertgen C et al, *Acta Neurochirurgica (Wien)* 146:691-5, 2004

83% dos doentes ou seus familiares referiam que **concordariam** com o procedimeto se fosse necessário repeti-lo

craniectomia descompressiva

Decompressive craniectomy for ischemic stroke
Matsuura D, et al. *No To Shinkei*. 2006 Apr;58(4):305-10

Embora muitos doentes estivessem com incapacidade grave, **79%** do total (ou os seus familiares) responderam que **a operação tinha sido o procedimento correcto.**

87,5% dos doentes com bons resultados estava satisfeito com estes.

craniectomia descompressiva

Health status and life satisfaction after decompressive craniectomy for malignant middle cerebral artery infarction

Skoglund TS et al, *Acta Neurol Scand* 10, 123-6, 2007

83% consideravam vida satisfatória/muito **satisfatória**, enquanto que **17%** a consideravam pouco ou nada satisfatória

craniectomia descompressiva

Long-term outcome after hemicraniectomy for space occupying right hemisphere MCA infarction

Erban P et al, *Clin Neurol Neurosurg* 108:384-7, 2006

61% dos doentes aprovavam o procedimento

Depressão era frequente

craniectomia descompressiva

DESTINY

Juller E, et al *Stroke* 2007;38:2518-2525

100% dos doentes e "caregivers" concordavam com o procedimento, em entrevista ao fim de 1 ano

DECIMAL

Vahedi K, et al *Stroke* 2007; 38:2506-2517

???

craniectomia descompressiva

HAMLET

Hofmeijer J et al, *Lancet Neurol* 2009; 8:326-33

repercussão negativa no aspecto físico da qualidade de vida **(SF-36)**

depressão 78% operados; 58% não operados

14% dos representantes consideravam "inaceitável" a participação num estudo randomizado como este

craniectomia descompressiva

- “Surgical decompression should, therefore, be considered in patients up to 60 years old who deteriorate within 48 h from symptom onset”
- Aceitação doente / família
- Critérios institucionais
- Análise consistente dos resultados

craniectomia descompressiva

INFRATENTORIAL

- dados clínicos e imagiológicos
- sinais de herniação

- sinais cerebelosos
- hidrocefalia
- VI e VII pares

craniectomia descompressiva

INFRATENTORIAL

- extensão enfarte
- fossa posterior “cheia”
- compressão tronco
- obstrução IV ventrículo/hidrocefalia
- enfarte tronco

craniectomia descompressiva

INFRATENTORIAL

- DVE
- craniectomia
- craniectomia + DVE

- mortalidade - 80% → < 30%
- bons resultados clínicos - 58,8 a 81,8%