Update sulle lesioni emorragiche post-traumatiche

Corrado Iaccarino

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Traumatologia cranica
Aneurismi intracranici

NEURO UPDATE TORINO

9-10 marzo 2017

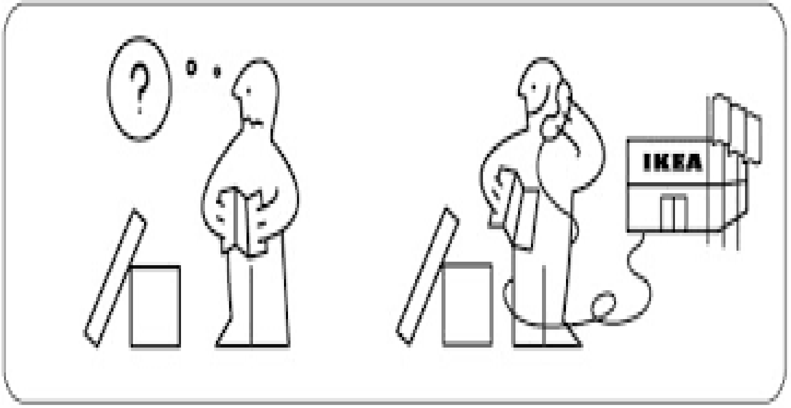
LAW UPDATING

DISEGNO DI LEGGE Disposizioni in materia di responsabilità professionale del personale sanitario

Art. 5.

(Buone pratiche clinico-assistenziali e raccomandazioni previste dalle linee guida)

1. Gli esercenti le professioni sanitarie, nell'esecuzione delle prestazioni sanitarie con finalità preventive, diagnostiche, terapeutiche, palliative e riabilitative, si attengono, salve le specificità del caso concreto, alle buone pratiche clinico-assistenziali e alle raccomandazioni previste dalle linee guida elaborate dalle società scientifiche iscritte in apposito elenco istituito e regolamentato con decreto del Ministro della salute, da emanare entro centottanta giorni dalla data di entrata in vigore della presente legge. Ai fini della presente legge, le linee guida sono inserite nel Sistema nazionale per le linee guida (SNLG) e pubblicate nel sito *internet* dell'Istituto superiore di sanità.



Neurosurgery 0:1–10, 2016

Guidelines for the Management of Severe Traumatic Brain Injury, Fourth Edition

This document provides recommendations only when there is evidence to support them

<u>These recommendations do not constitute a complete protocol for clinical use</u>

Neurosurgery 0:1–10, 2016

Guidelines for the Management of Severe Traumatic Brain Injury, Fourth Edition

These recommendations be used by others to develop treatment protocols, which necessarily need to incorporate consensus and clinical judgment in areas where current evidence is lacking or insufficient.

aSDH

Present in up to 1/3 of patients with severe TBI

Historically associated with a high mortality rate (between 40-60%) and functional recovery which ranges from 19 to 45%

Approximately 2/3 of patients with TBI undergoing emergency cranial surgery have an ASDH evacuated

LACK OF EVIDENCES

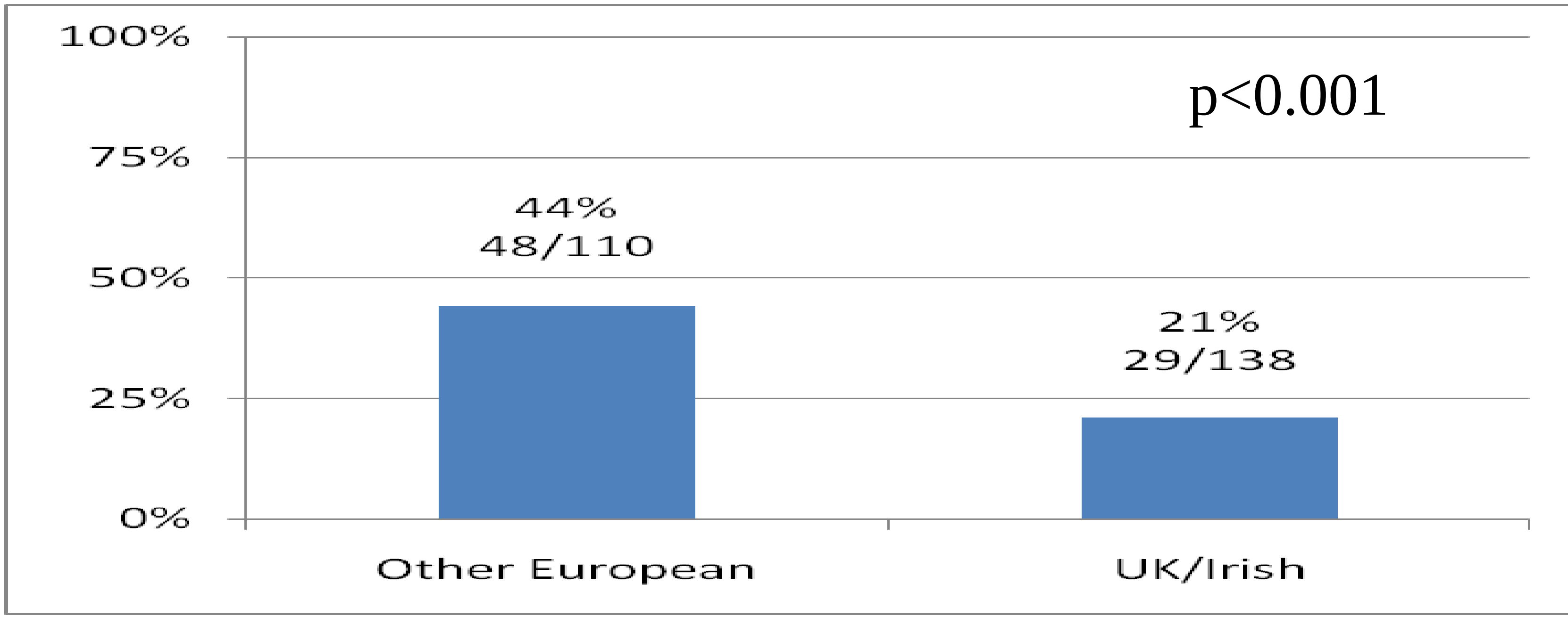
Decompressive Craniectomy

Primary decompressive craniectomy for acute subdural haematomas: results of an international survey

Acta Neurochir (2012) 154:1563–1565
DOI 10.1007/s00701-012-1349-6

Angelos G. Kolias · Antonio Belli · Lucia M. Li · Thomas Santarius · David K. Menon · Ivan Timofeev · Elizabeth A. Corteen · John D. Pickard · Peter J. Kirkpatrick · Peter J. Hutchinson

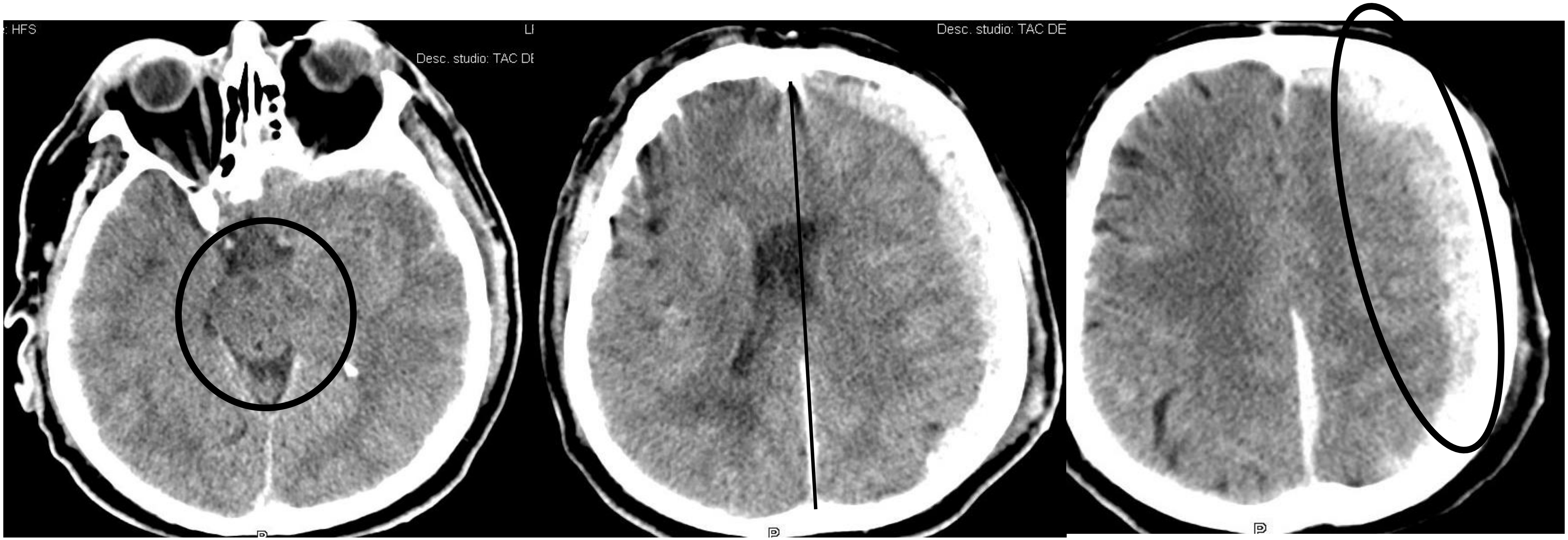
Use of primary DC in >50% of ASDH cases



•It cannot be explained by differences in trauma care systems or epidemiology

• It probably reflects the **lack of high quality evidence**

CLEAR RADIOLOGICAL FINDINGS OF MASS EFFECT



Hernia + Shift + Volume

HIGH PROBABILITY FOR DC

UP TO INTRAOPERATIVE FINDINGS

VOLUME > Shift

Certainty for Surgery on aSDH
BUT PRIMARY DC ?

65 y, rural job accident , GCS 12 on scene – GCS 9 after CT
No shift – No basal cistern effacement

SHIFT> volume

Certainty for Surgery on aSDH
BUT PRIMARY DC ?

24 y
Bicycle fall

GCS 14 on scene

GCS 11 after CT

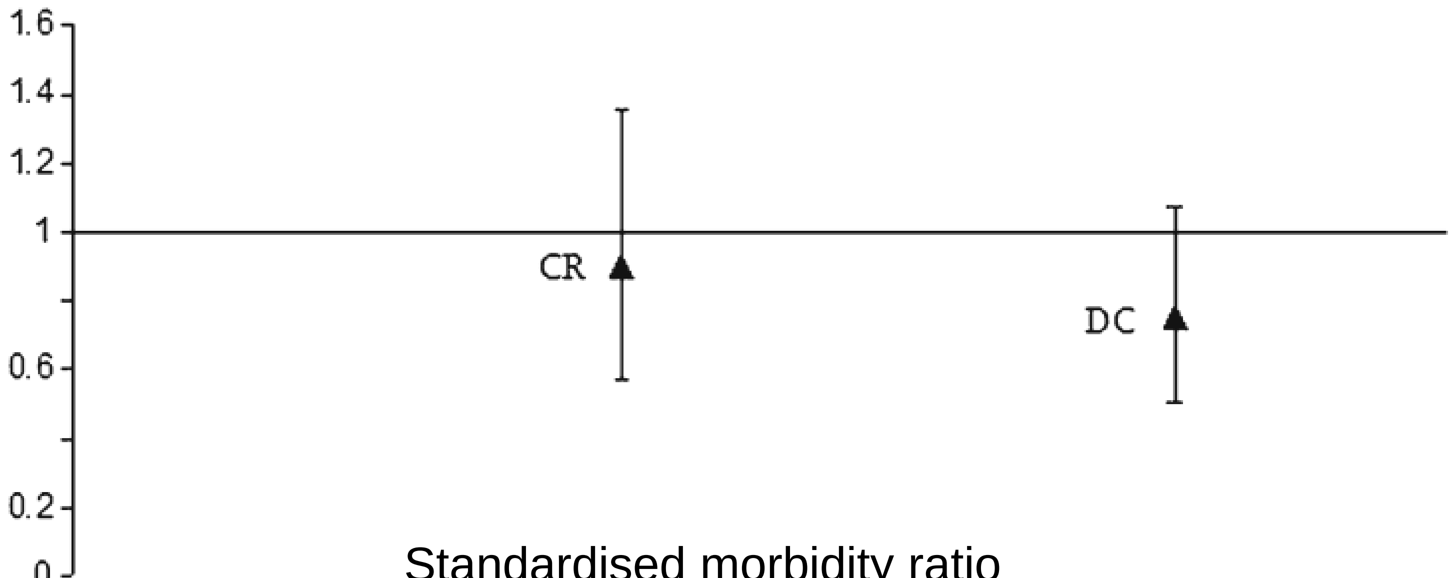
Cambridge experience (n=91)

Acta Neurochir (2012) 154:1555–1561
DOI 10.1007/s00701-012-1428-8

CLINICAL ARTICLE

Outcome following evacuation of acute subdural haematomas: a comparison of craniotomy with decompressive craniectomy

Although the confidence intervals overlapped, this study suggests that **primary DC could be more effective than craniotomy for patients with ASDH**



Standardised morbidity ratio
was lower in individuals who received DC

CR - **0.90** (95 % CI: 0.57–1.35)
DC - **0.75** (95 % CI: 0.51–1.07)

RESCUE ASDH

Protocol Number:	RESCUE-ASDH14
ISRCTN Number:	ISRCTN8737 0545
Protocol Version:	2.0
Protocol date:	8th June 2015

Randomised Evaluation of Surgery with Craniectomy for patients Undergoing Evacuation of Acute Subdural Haematoma (**RESCUE-ASDH**)

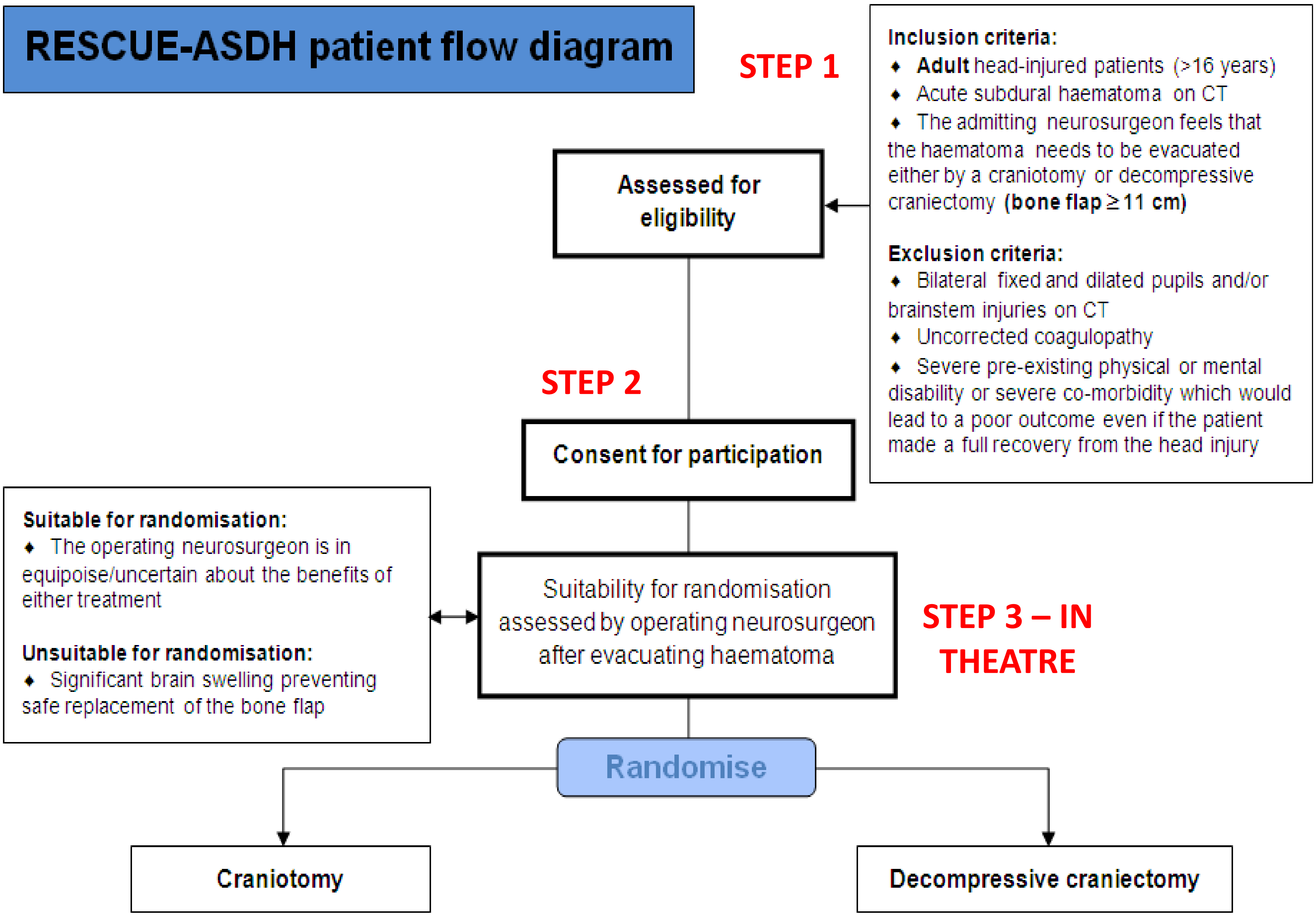
RESCUE-ASDH is a multi-centre, pragmatic, parallel group randomised trial comparing craniectomy vs. craniotomy for acute subdural haematoma patients.

Chief Investigator
Professor Peter Hutchinson
Professor of Neurosurgery & Honorary Consultant Neurosurgeon
University of Cambridge & Cambridge University Hospitals NHS Foundation Trust
Division of Neurosurgery, Box 167, University of Cambridge, Cambridge Biomedical Campus, Cambridge, CB2 0QQ
Telephone +44 (0) 1223336946
Fax +44 (0) 1223216926
Email: pjah2@cam.ac.uk

Hypothesis: the ability to control ICP (brain swelling) with a primary DC may improve outcome

Italian recruitment: iaccarino.corrado@gmail.com

RESCUE-ASDH patient flow diagram



BRAIN CONTUSION
LACK OF EVIDENCES

- Prediction of progression
- Surgical Indication

MONITORING

- CLINICAL parameters
- NEURORADIOLOGICAL parameters
- NEUROPHYSIOLOGICAL parameters (ICP)

THESE PARAMETERS DO NOT HAVE THE SAME EVOLUTIVE BEHAVIOR

Patients with brain contusions: predictors of outcome and relationship between radiological and clinical evolution

J Neurosurg 120:908–918, 2014

Corrado Iaccarino, M.D.,[1] Paolo Schiavi, M.D.,[1] Edoardo Picetti, M.D.,[2] Matteo Goldoni, Ph.D.,[3] Davide Cerasti, M.D.,[4] Marialuisa Caspani, M.D.,[2] and Franco Servadei, M.D.[1]

The aim of this retrospective, multi-center study was to identify predictors of unfavourable outcome, analyze the evolution of brain contusions and evaluate specific indications for surgery

From January 2008 to December 2011
All patients with TBI + cerebral contusion (CT scan) treated in the Hospitals of the northwestern Emilia

Inclusion criteria:

- Brain contusion > 1 ml
- ≥ 3 CT scan acquired
- Hospitalization 1st day of TBI
- All clinical data available

} 352 Patients
(277 excluded)

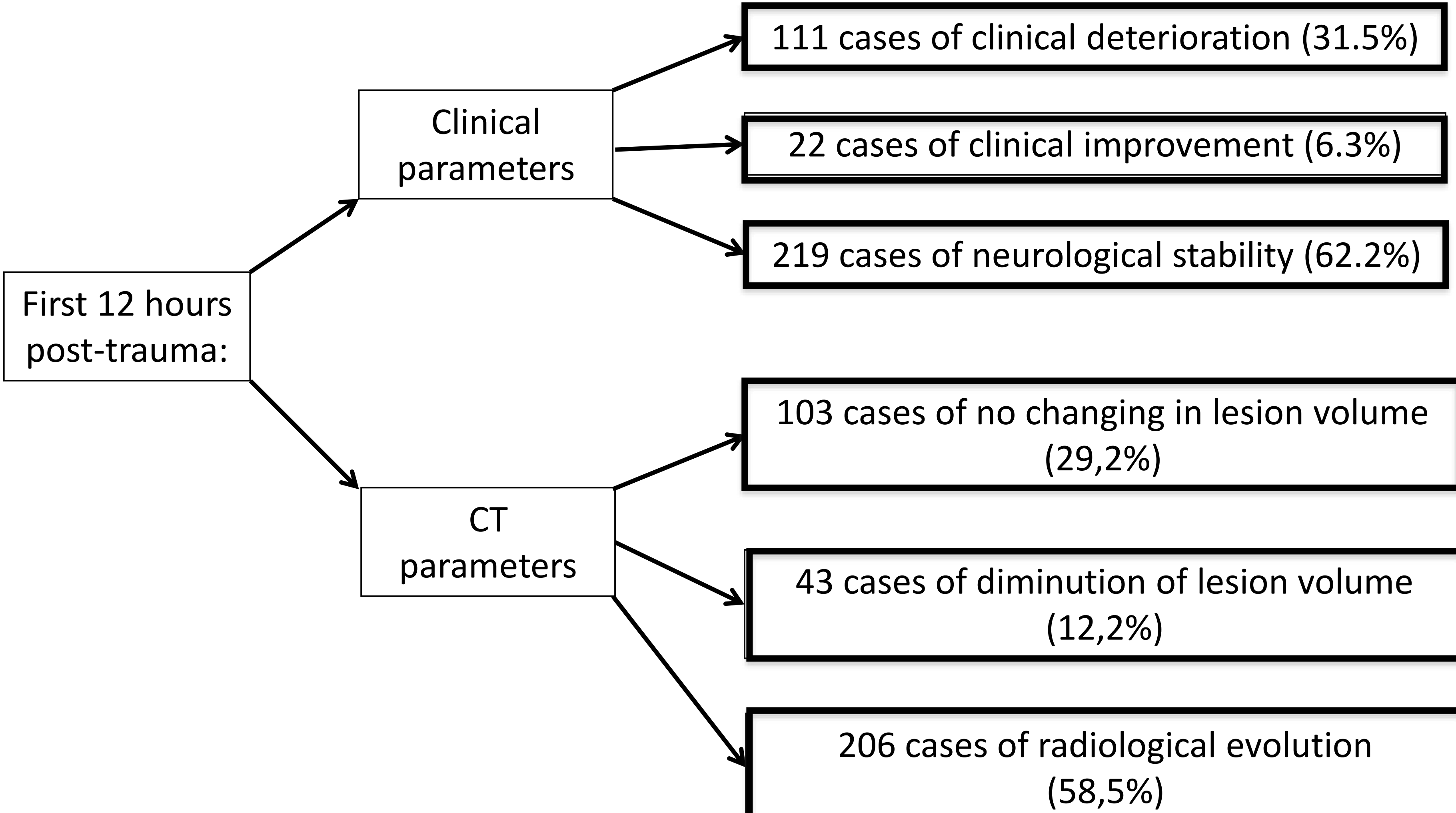
Patient demographics
&
Radiological parameters on CT admission

Variable	No. of Patients (%)*
treatment site	
neurosurgical hospital 1†	236 (67.1)
neurosurgical hospital 2‡	45 (12.8)
peripheral hospital	71 (20.1)
patient sex	
M	256 (72.7)
F	96 (27.3)
comorbidities	
absent	217 (64.5)
present	125 (35.5)
antiaggregant therapy	
absent	273 (77.6)
present	79 (22.4)
anticoagulant therapy	
absent	330 (93.8)
present	22 (6.2)
mechanism of injury	
high-energy trauma	206 (41.3)
low-energy trauma	145 (58.7)
GCS score at admission	
3–8	101 (28.7)
9–13	105 (29.8)
14–15	146 (41.5)
surgical procedure	45 (12.7)
GOSE score	
patient age 3–98 yrs	
unfavorable	121 (34.4)
favorable	231 (65.6)
patient age 18–60 yr	
unfavorable	65 (18.4)
favorable	287 (81.6)

* Mean patient age ± SD was 59.1 ± 23.4 years.

Variable	No. of Patients (%)
no. of cerebral contusions	
1	261 (74.1)
≥2	91 (25.9)
total intraparenchymal bleeding (ml)	
1–10	307 (87.2)
10–25	28 (8.1)
>25	17 (4.7)
midline shift >5 mm on admission CT image	
present	76 (21.6)
absent	276 (78.4)
basal cisterns status on admission CT image	
absent or compressed	69 (19.6)
normal	283 (80.4)
other associated lesions	
subdural hematoma	169 (48)
subarachnoid hemorrhage	242 (68.8)
epidural hematoma	40 (11.4)
intraventricular hemorrhage	32 (9.1)
cranial fracture	145 (41.2)

RADIOLOGICAL AND CLINICAL PROGRESSION



Multivariate analysis:
At FOLLOW-UP CT Scan
midline shift and/or basal cisterns effacement predictor
for onset of clinical deterioration

	Univariate p value	Multivariate p value	Exp(B)	95% CI per EXP(B)	
				Inferiore	Superiore
Midline shift on admission CT	.676	.655	1.408	.314	6.325
Total haematoma volume	.0003	.927	.957	.377	2.429
Oedema volume evolution	<.0001	.753	.856	.326	2.249
Midline shift on follow up CT	<.0001	.000	.009	.003	.027
Basal cisterns on admission CT	<.0001	.988	1.011	.264	3.867
Basal cisterns on follow up CT	<.0001	.000	.054	.020	.145
Haematoma evolution	<.0001	.177	1.051	.978	1.130
Increase in hematoma volume	<.0001	.225	1.002	.999	1.005

ASSOCIATION BETWEEN CLINICAL AND RADIOLOGICAL PARAMETERS AND NEED FOR SURGERY AFTER 2ND CT SCAN

Variable	Surgery (n = 46)	No Surgery (n = 291)	Univariate p Value	Multivariate p Value*
GCS score at admission				
14–15	2	144	<0.0001	**0.03**
9–13	12	93	0.5	0.078
3–8	32	54	<0.0001	**0.019**
mean patient age (yrs) ± SD	55.6 ± 28.3	74. ± 25.1	<0.0001	**<0.0001**
worsening clinical condition	36	75	<0.0001	**0.03**
radiological appearance				
increase or onset of midline shift	31	66	<0.0001	**0.013**
worsening of basal cistern status	29	78	<0.0001	**0.002**
evolution of hematoma	28	121	0.02	0.277
increased edema	22	140	0.06	0.102

* Boldface indicates statistical significance.

TABLE 5: Predictors of favorable/unfavorable outcome*

Predictor	Univariate p Value	Multivariate p Value	Exp(B)	95% CI per EXP(B)
age	<0.0001	**0.000**	0.943	0.914–0.972
sex	0.012	0.395	1.505	0.587–3.857
hypertension	0.012	0.791	1.143	0.426–3.065
cardiopathy	<0.0001	0.863	0.902	0.280–2.905
diabetes	0.013	0.395	1.765	0.476–6.537
antiaggregant therapy	<0.0001	0.588	1.336	0.469–3.801
anticoagulant therapy	0.235	0.350	0.333	0.033–3.351
INR at admission	<0.0001	0.323	0.448	0.091–2.203
mechanism of injury	<0.0001	0.434	0.662	0.235–1.862
GCS score at admission				
3–8	<0.0001	**0.000**		
9–13	<0.0001	**0.000**	0.034	0.010–0.113
14–15	<0.0001	**0.005**	0.211	0.072–0.621
SAH (1st scan)	0.001	0.748	1.160	0.470–2.862
SDH (1st scan)	0.006	0.349	1.509	0.638–3.565
EDH (1st scan)	0.861	0.461	1.639	0.441–6.094
cranial fracture	0.363	0.136	0.518	0.219–1.229
total hematoma vol	<0.0001	0.366	0.969	0.906–1.037
midline shift on admission CT	<0.0001	0.234	0.396	0.086–1.819
clinical deterioration	<0.0001	**0.003**	6.316	1.867–21.373
surgery	0.018	0.419	0.616	0.190–1.995
hematoma evolution	0.002	0.099	2.159	0.865–5.390
edema vol evolution	<0.0001	0.520	0.713	0.254–2.000
midline shift on follow-up CT	<0.0001	**0.000**	10.668	3.268–34.827
basal cistern status on admission CT	<0.0001	0.293	0.474	0.118–1.907
basal cistern status on follow-up CT	<0.0001	0.210	1.914	0.694–5.280
increased hematoma vol	<0.0001	0.663	1.001	0.997–1.004

* EDH = epidural hematoma; INR = international normalized ratio; SAH = subarachnoid hemorrhage; SDH = subdural hematoma.

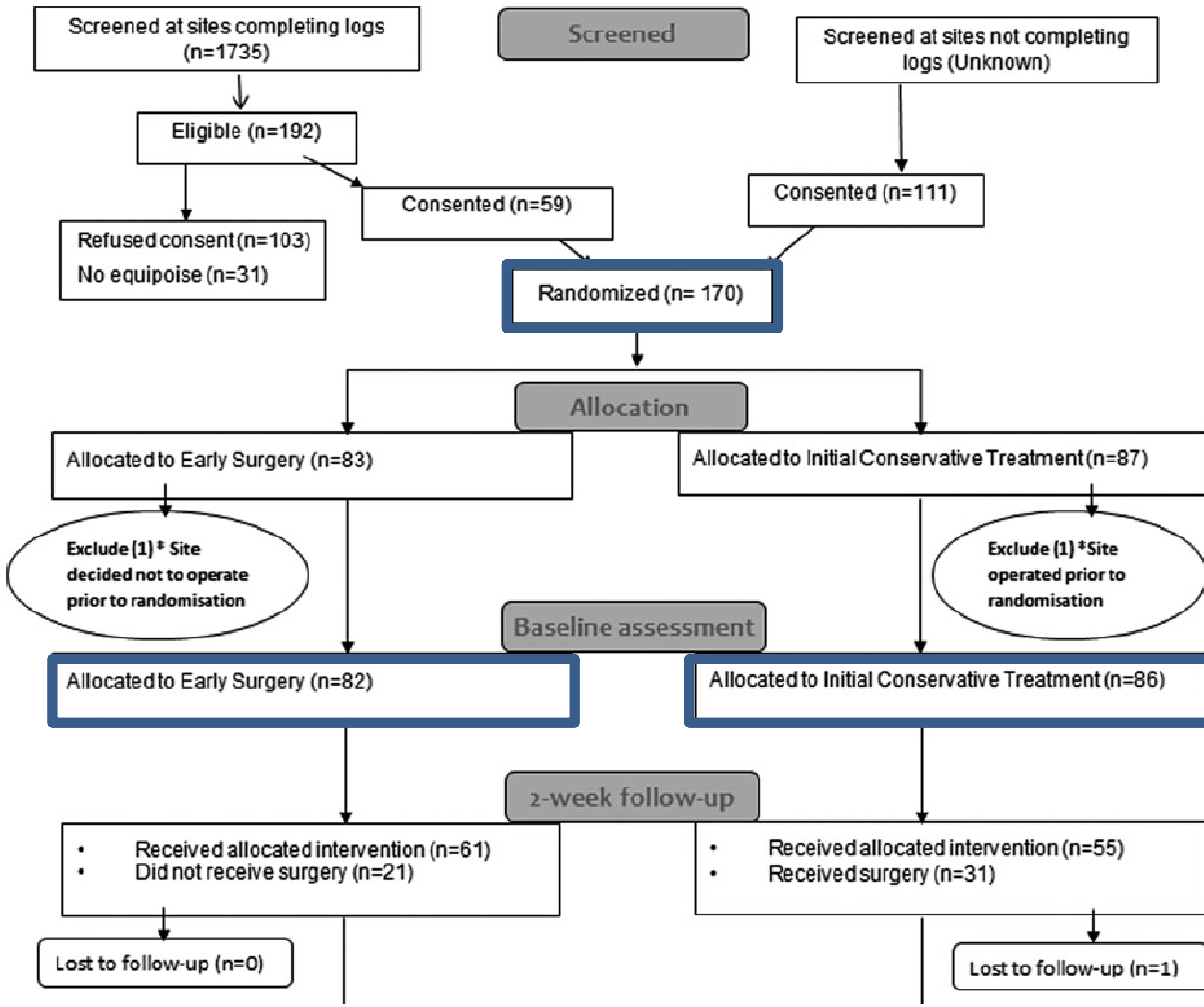
OUTCOME

Variable	Surgery (n = 46)	No Surgery (n = 291)
patient outcome		
favorable	21 (45.6%)	204 (70.1%)
severe disability	18 (39.1%)	44 (15.1%)
death	7 (15.2%)	43 (14.7%)

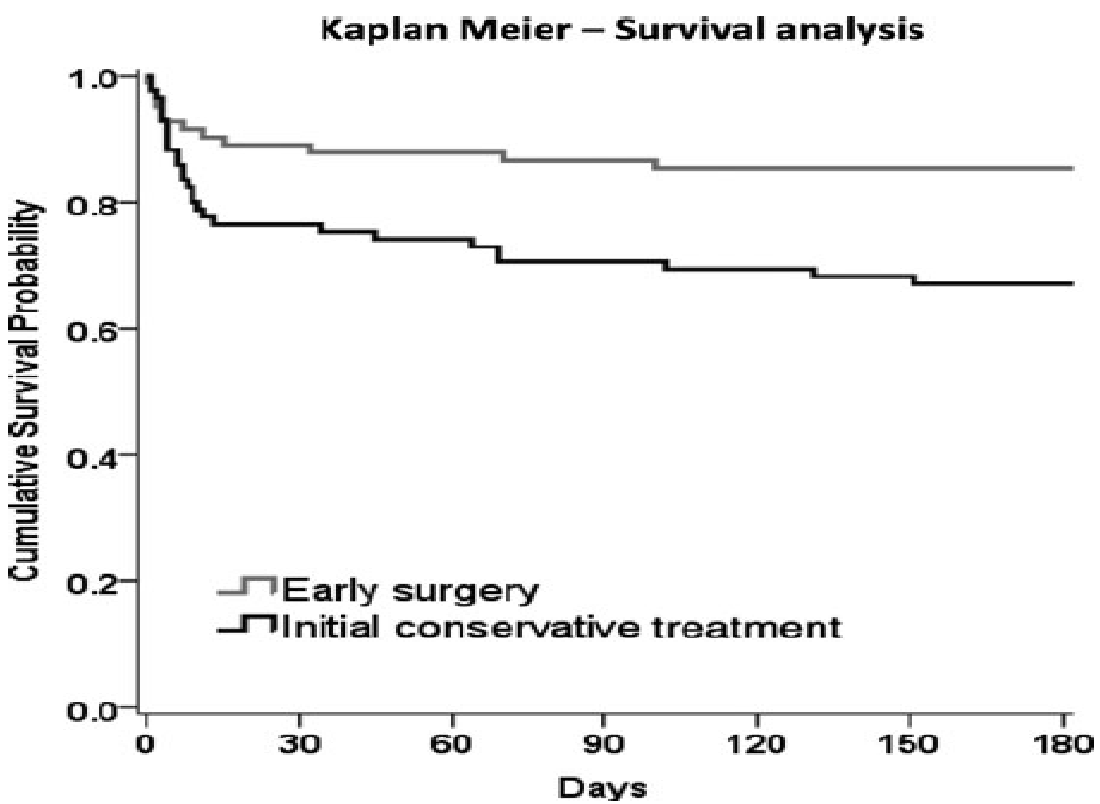
Early Surgery versus Initial Conservative Treatmen in Patients with Traumatic Intracerebral Hemorrhage (STITCH[Trauma]): The First Randomized Trial

JOURNAL OF NEUROTRAUMA 32:1312–1323 (September 1, 2015)

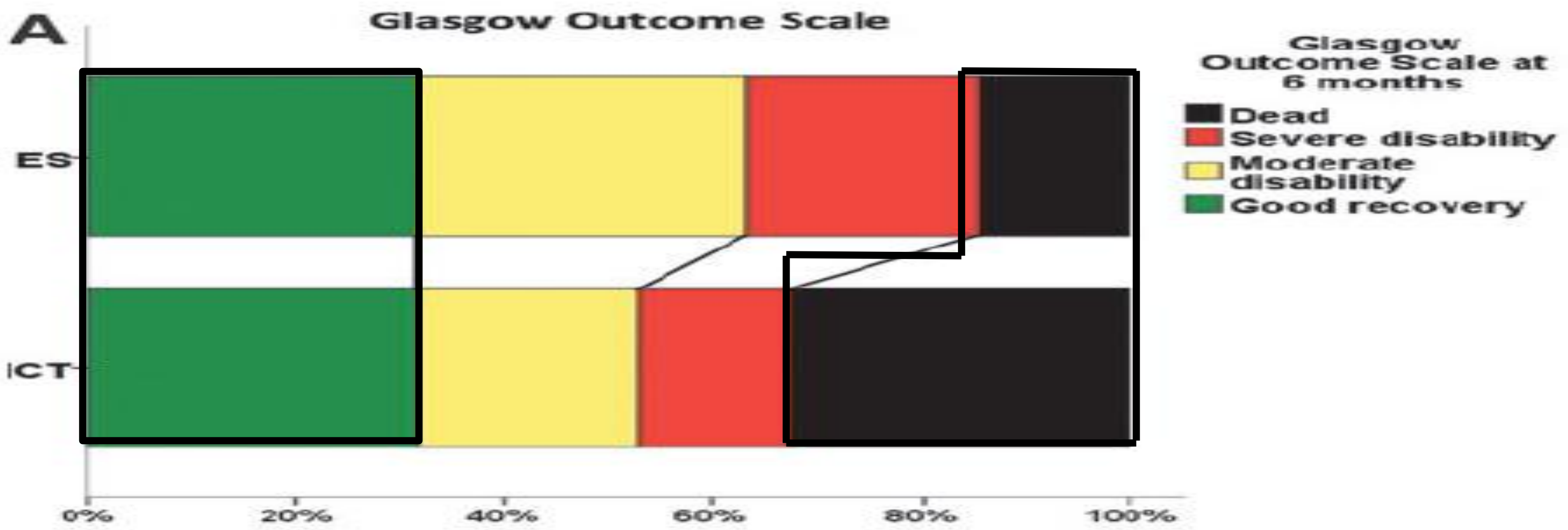
A. David Mendelow,[1] Barbara A. Gregson,[1] Elise N. Rowan,[1] Richard Francis,[1] Elaine McColl,[2] Paul McNamee,[3] Iain R. Chambers,[4] Andreas Unterberg,[5] Dwayne Boyers,[3] and Patrick M. Mitchell[6] on behalf of the STITCH(Trauma) Investigators

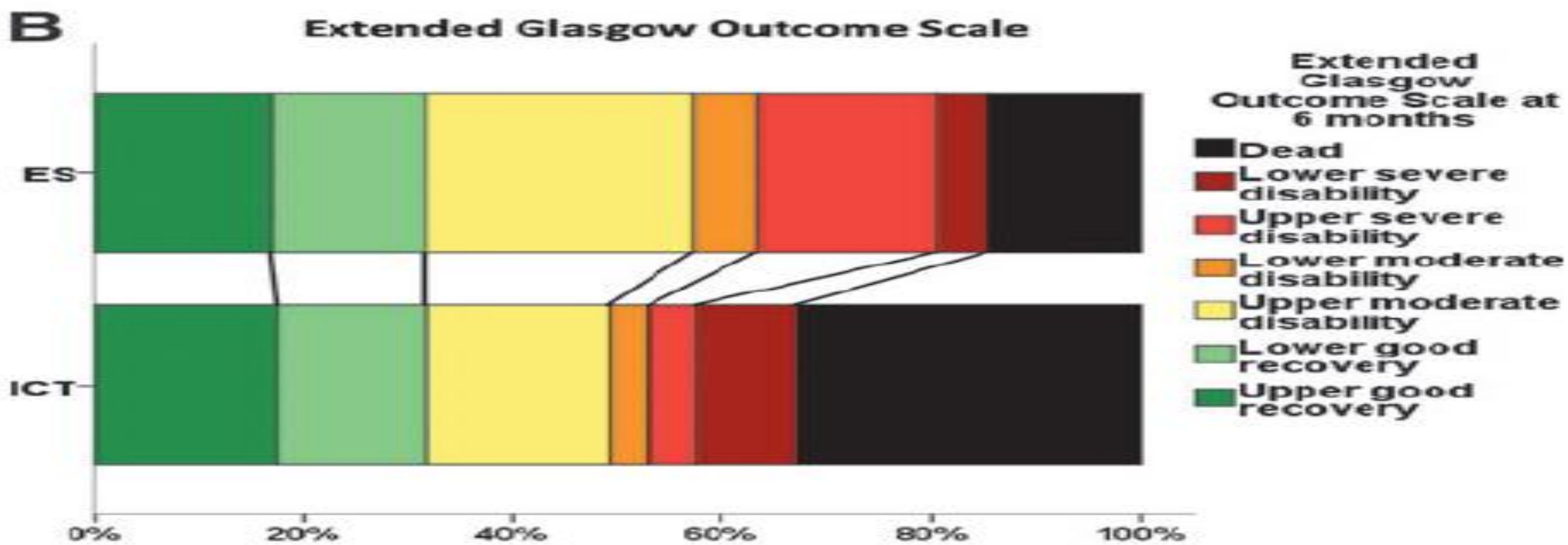


	Early surgery	Initial conservative treatment	Test and p value	Absolute difference (95% CI)
Primary outcome (%)	$N = 82$	$N = 85$		
Unfavorable	30 (37)	40 (47)	χ^2	$p = 0.170$
Favorable	52 (63)	45 (53)		10.5 (−4.4–25.3)
Secondary outcomes	$N = 82$	$N = 85$		
Mortality at 6 months (%)				
Dead	12 (15)	28 (33)	χ^2	$p = 0.006$
Alive	70 (85)	57 (67)		18.3 (5.7–30.9)
Rankin (%)				
Unfavorable	27 (33)	37 (44)	χ^2	$p = 0.159$
Favorable	55 (67)	48 (56)		10.6 (−4.0–25.3)



SURGERY FOR TRAUMATIC ICH RCT: STITCH(TRAUMA)



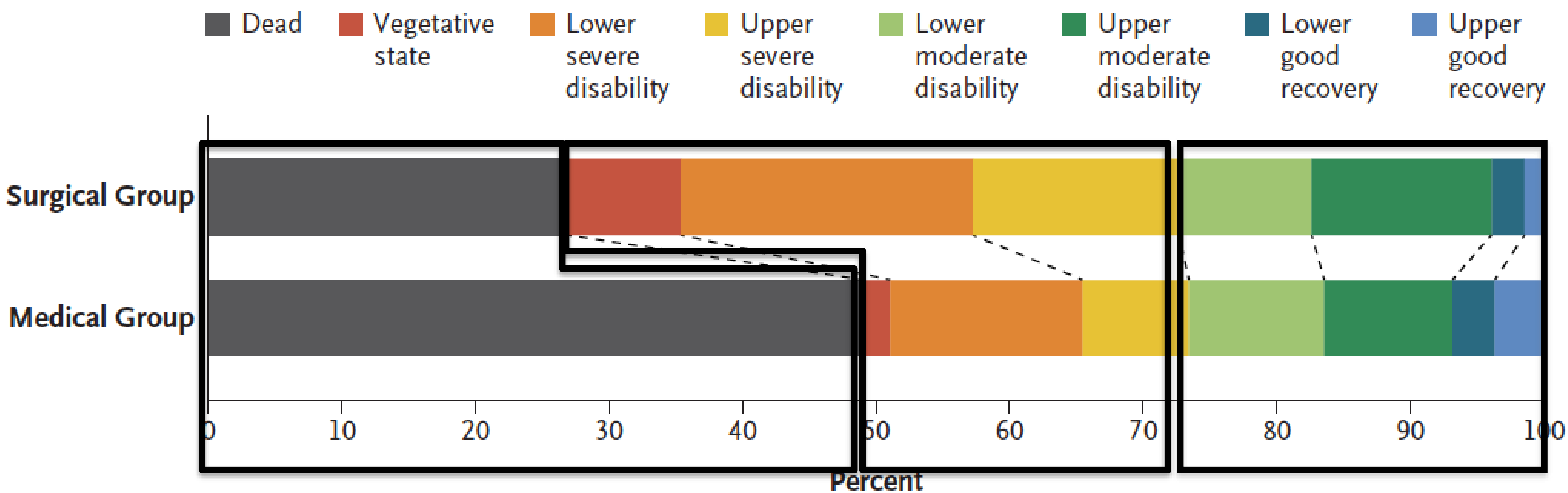


The NEW ENGLAND JOURNAL of MEDICINE
ESTABLISHED IN 1812 SEPTEMBER 22, 2016 VOL. 375 NO. 12

Trial of Decompressive Craniectomy for Traumatic Intracranial Hypertension

P.J. Hutchinson, A.G. Kolias, I.S. Timofeev, E.A. Corteen, M. Czosnyka, J. Timothy, I. Anderson, D.O. Bulters, A. Belli, C.A. Eynon, J. Wadley, A.D. Mendelow, P.M. Mitchell, M.H. Wilson, G. Critchley, J. Sahuquillo, A. Unterberg, F. Servadei, G.M. Teasdale, J.D. Pickard, D.K. Menon, G.D. Murray, and P.J. Kirkpatrick, for the RESCUEicp Trial Collaborators*

GOS-E Results at 6 Mo (primary end point)



....dramatically similar results....

Early Surgery versus Initial Conservative Treatment in Patients with Traumatic Intracerebral Hemorrhage (STITCH[Trauma]): The First Randomized Trial

Conclusion

there is a strong case for operating on patients with TICH who have a GCS of 9–12.

Those who are alert or just confused (GCS 13–15) can probably be watched carefully for any deterioration

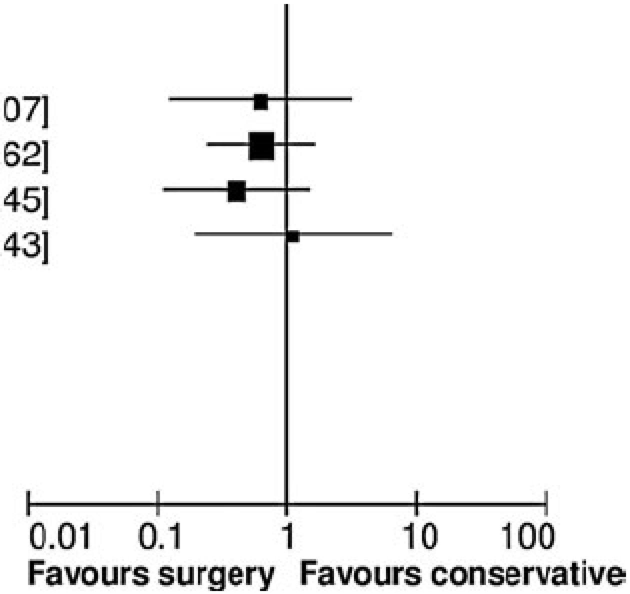
Once the GCS has descended below 9, surgical intervention appears to be less effective.

A strategy of early surgery is associated with a small, nonsignificant increase in health care costs

BIAS SELECTION?

Geographic region					
Europe	5	11	8	14	0.63 [0.13, 3.07]
India	13	37	17	37	0.64 [0.25, 1.62]
China	9	23	11	18	0.41 [0.12, 1.45]
Malaysia,Pakistan,Nepal,Egypt	3	11	4	16	1.13 [0.20, 6.43]
Total events	30	82	40	85	

Heterogeneity: Chi² = 0.87, df = 3 (P = 0.83); I² = 0%



None of the subgroups displayed any significant heterogeneity of treatment

Some units in some countries routinely measure ICP whereas others do not. In this study, 86% of patients were not monitored for ICP either because the hospital did not have the technology available or because they do not routinely use it for this patient group.[24]

Should early surgery be undertaken in patients with TICH when there is no option for ICP measurement?

PubMed.gov
US National Library of Medicine
National Institutes of Health

Languages: english
Species: humans
From 01/01/1990

Title/abstract:

«contusion/s», «lesion/s», «h(a)emorrhage/s», «intracranial mass/es», «h(a)ematoma/s»

AND

«icp » «intracranial pressure»

Lack of Class I Evidence

Clinical applications of intracranial pressure monitoring in traumatic brain injury

Acta Neurochir
Received: 28 April 2014 / Accepted: 2 May 2014
Published online: 22 May 2014

Report of the Milan consensus conference

SINCh SOCIETÀ ITALIANA NEUROCHIRURGIA

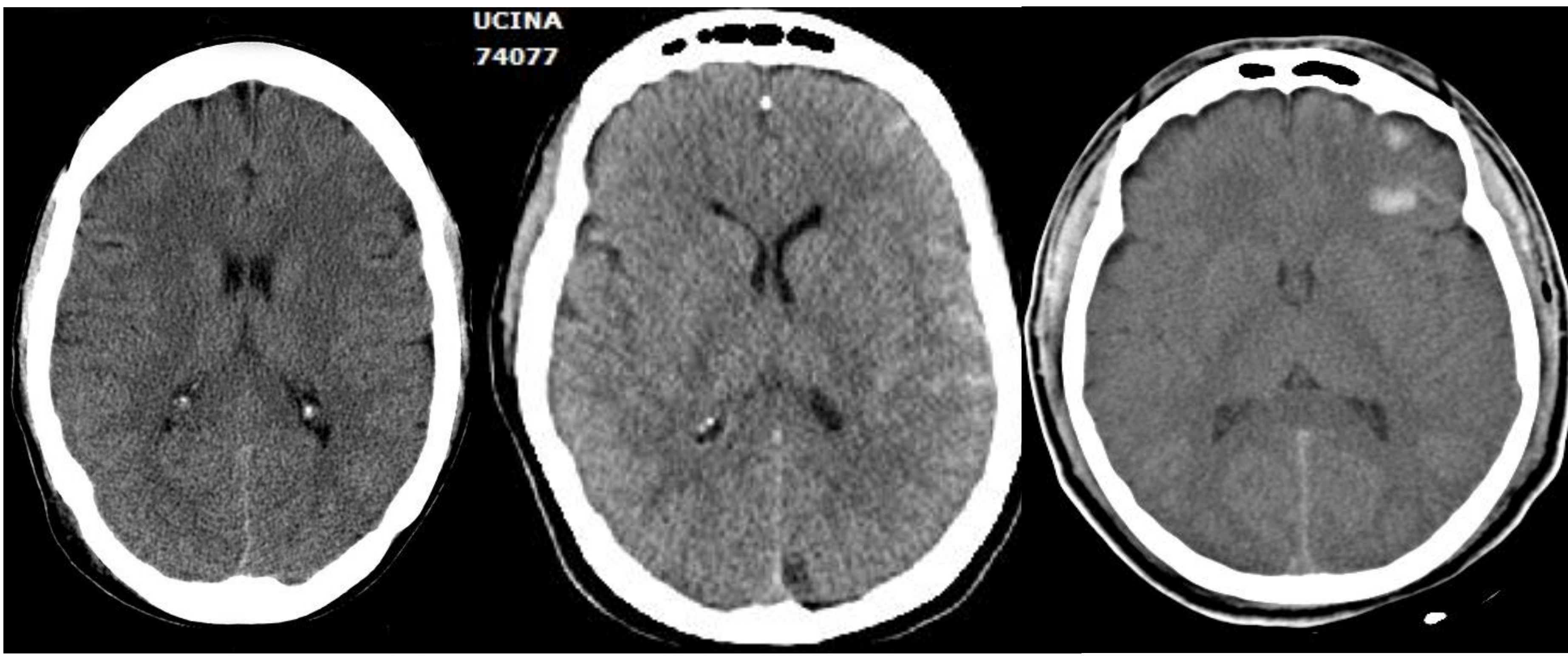
THE EUROPEAN ASSOCIATION OF NEUROSURGICAL SOCIETIES

GCS ≤ 8 &
Normal or tSAH or Petechiae

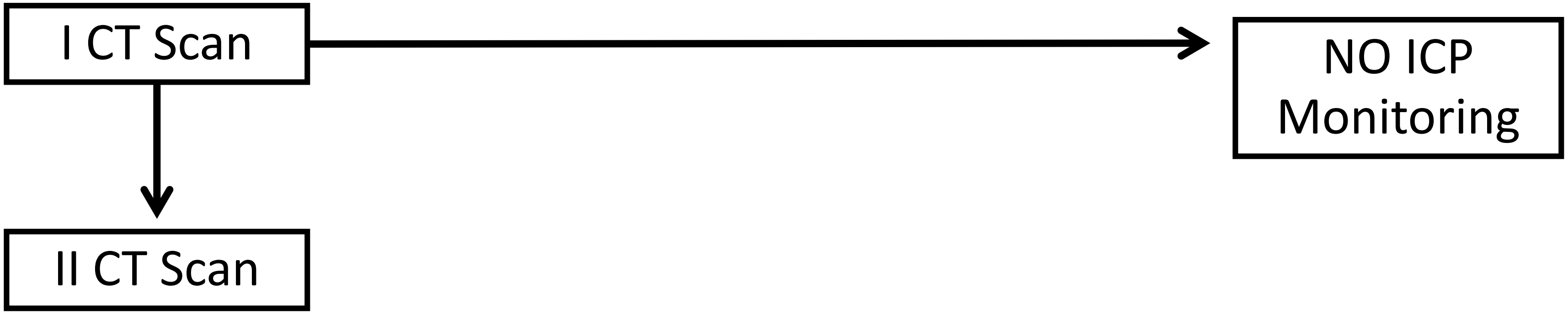
I CT Scan

GCS ≤ 8 &
Normal or tSAH or Petechiae

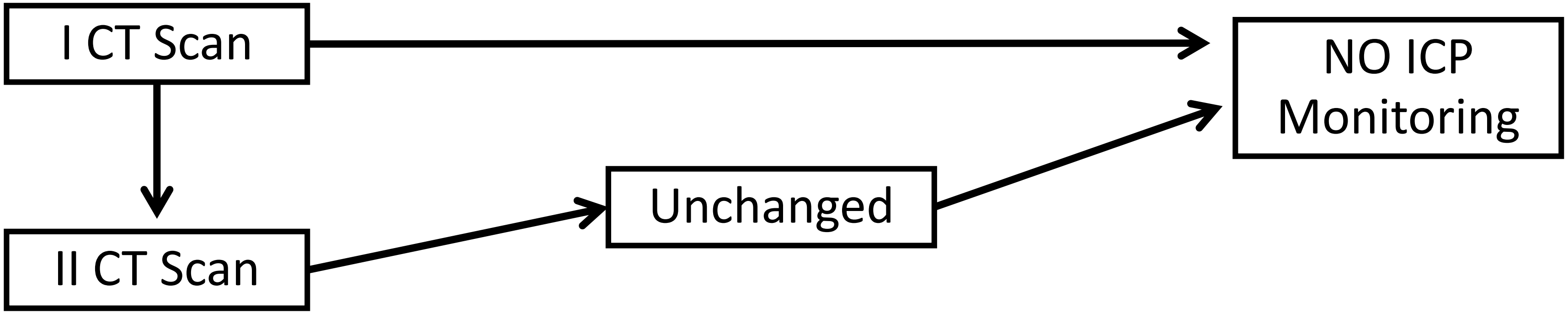
I CT Scan → NO ICP Monitoring !!



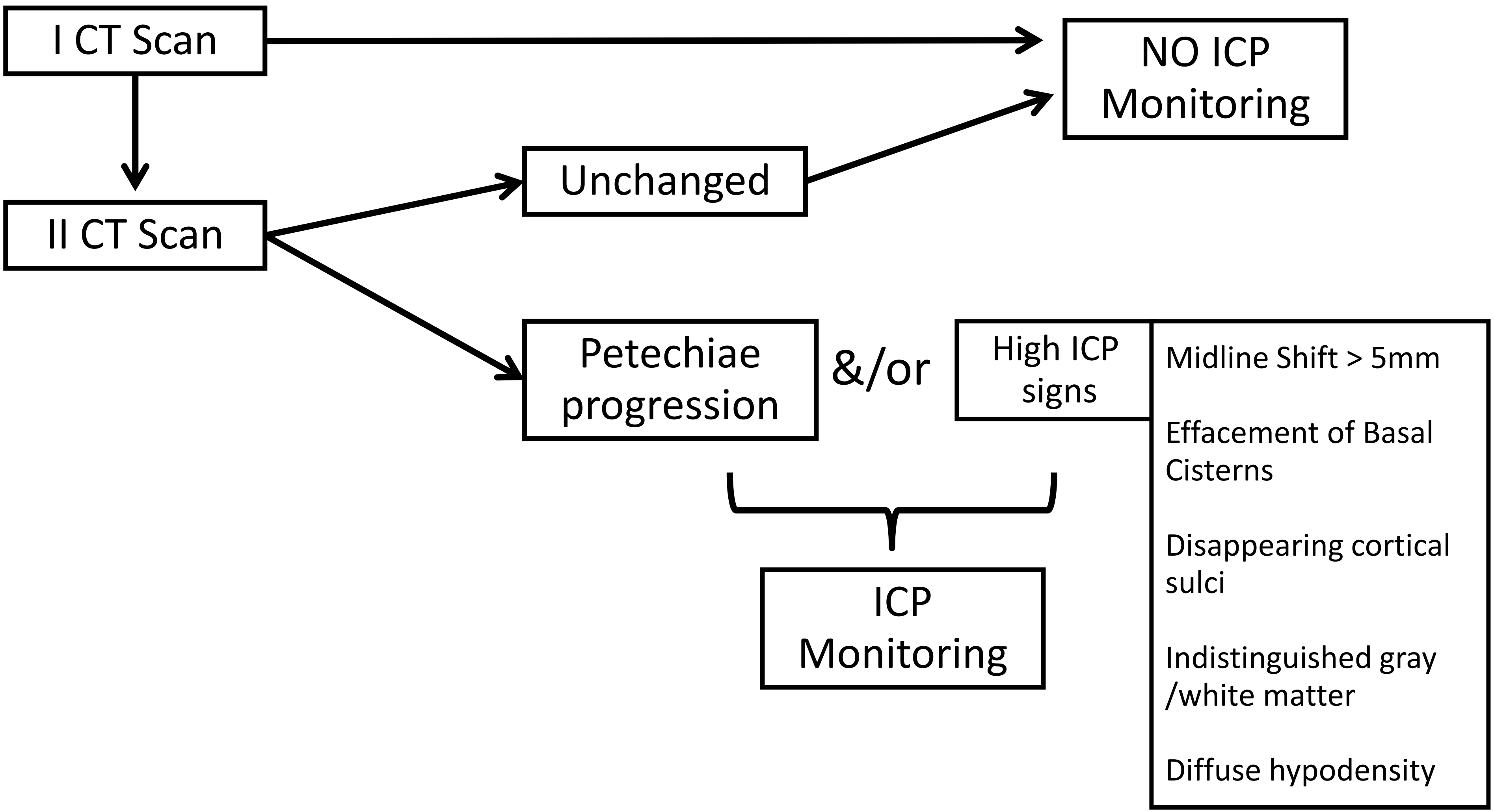
GCS ≤ 8
tSAH or Petechiae



GCS ≤ 8
tSAH or Petechiae



GCS ≤ 8
tSAH or Petechiae



ICP CONSENSUS 2014

BRAIN CONTUSION
ICP MONITORING RECOMMENDATION

- Sedation interruption is <u>dangerous for</u> :

  Rx signs high ICP and/or

  Respiratory failure and/or

  Ongoing emergency extracranial surgery

- GCS is <u>not completely reliable for</u> :

  SCI and/or

  Severe maxillofacial trauma

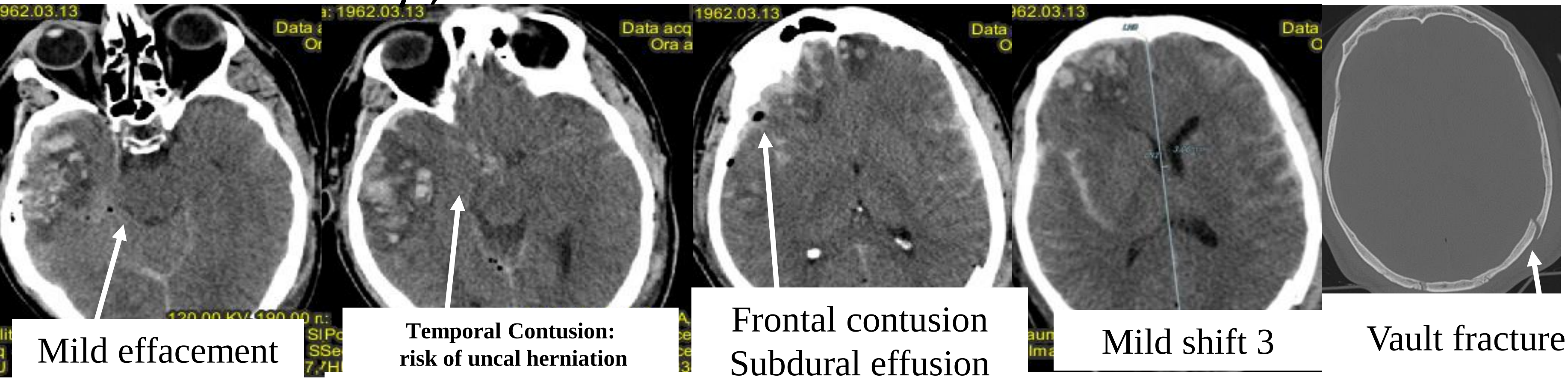
- Large bifrontal brain contusions
- Brain Contusions close to brainstem

ICP RULES

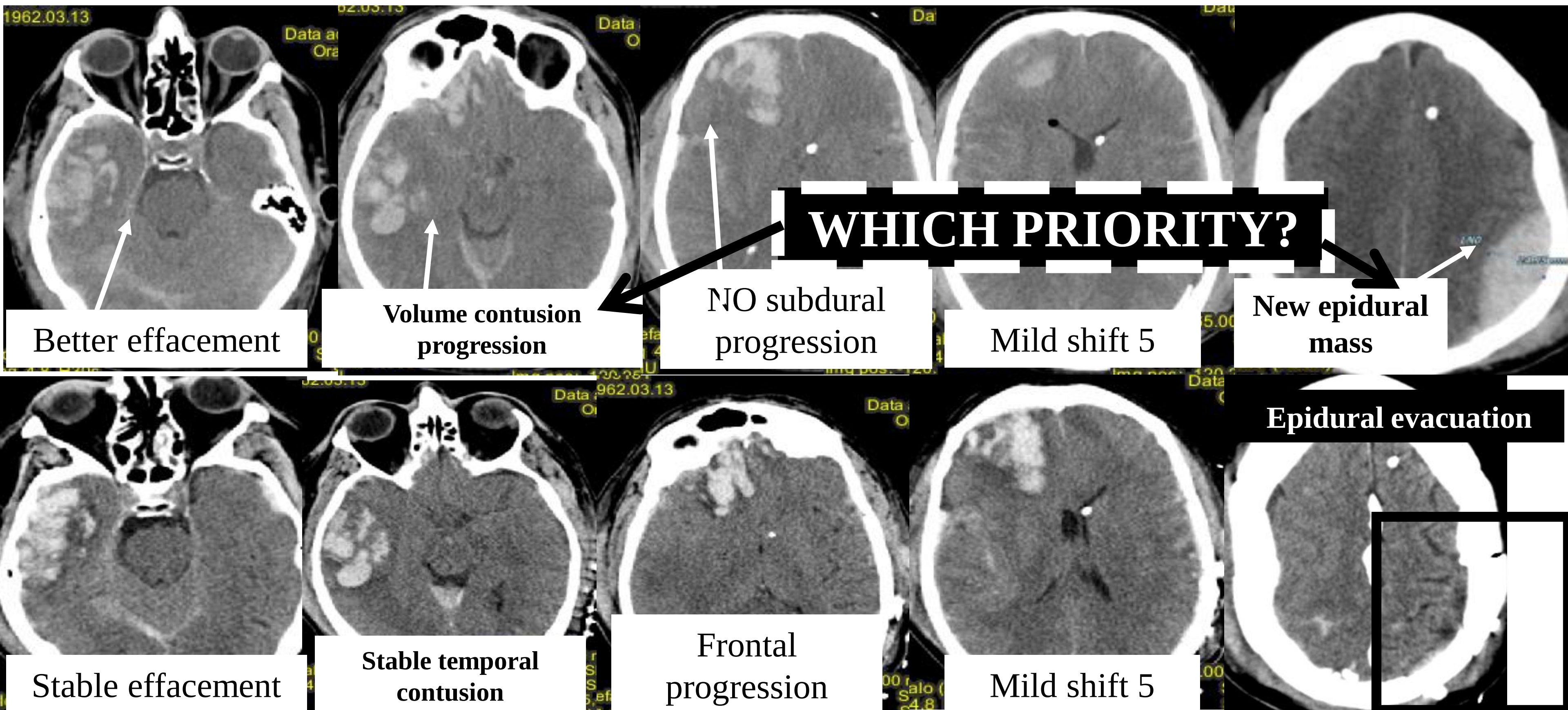
- ICU Monitoring
- Surgical indications
- Outcome

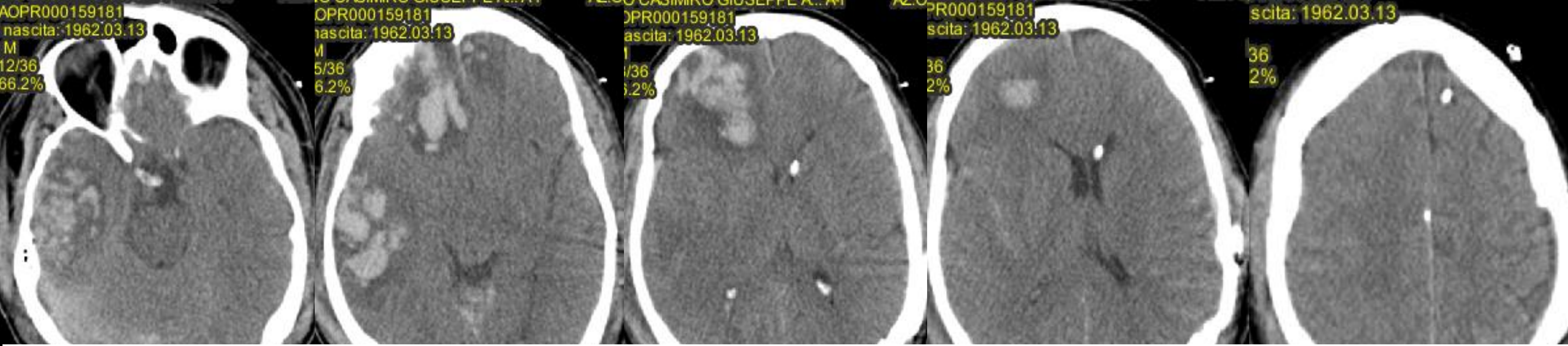
Mismatched with neuroradiological and clinical data

MCA♂ 54y ,Trafic accident GCS 15 on scene – GCS 13 in ER



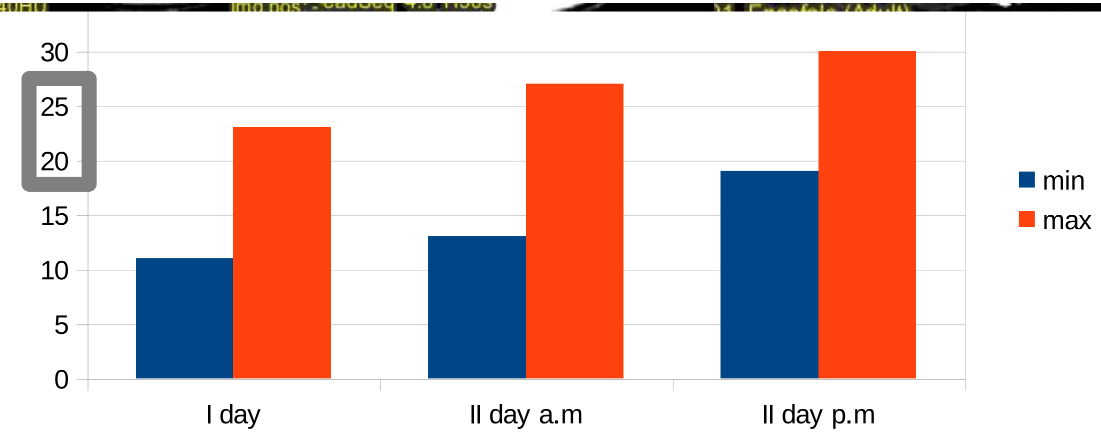
EVS – ICU Admission – Elevated ICP trend – 6h control CT scan





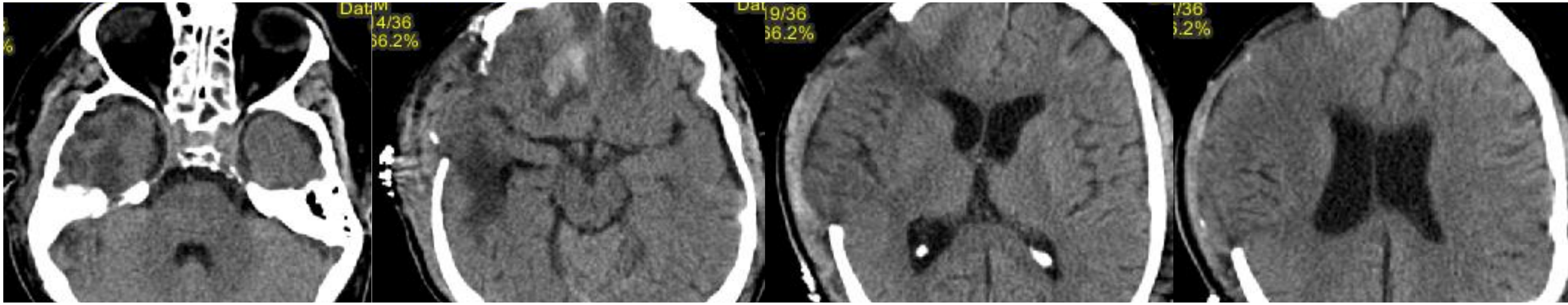
24h postop: Stable effacement,volume,shift–mild R oedema progression

48h postop: rising ICP trend

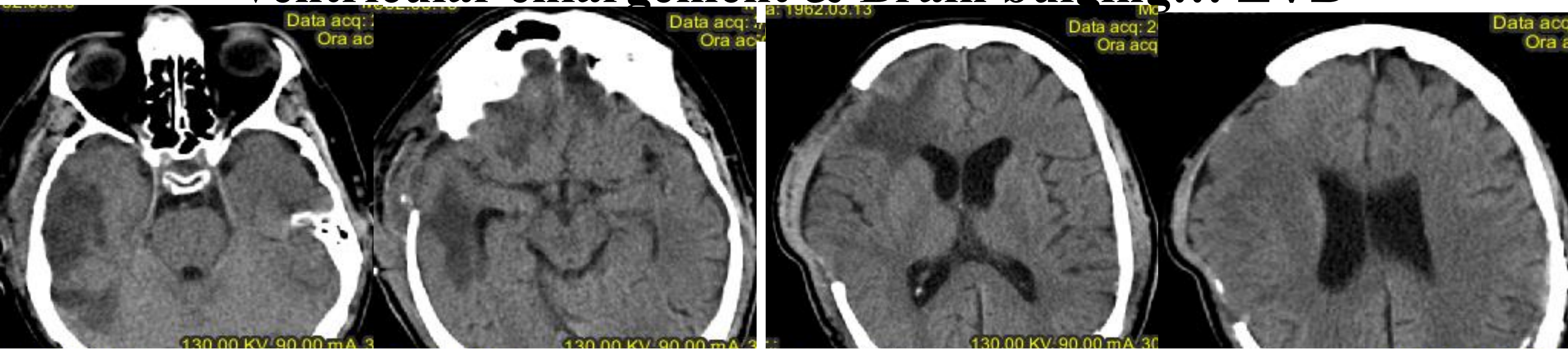


Secondary decompressive craniectomy + temporal toilette contusion

9 d post-DC: **Open Box!!** & Amyne for hypotension, volume expanders, E. Cloacae pneumonia,



Ventricular enlargement & Brain bulging… EVD



17d postDC: GCS E3M6Vt, left paresis- 7d EVD spontaneous remotion

1m post DC in NS: Awake, collaborating, left paresis (3/5)
...OVERTREATMENT?...HARD TO SAY...

36d post DC in NS

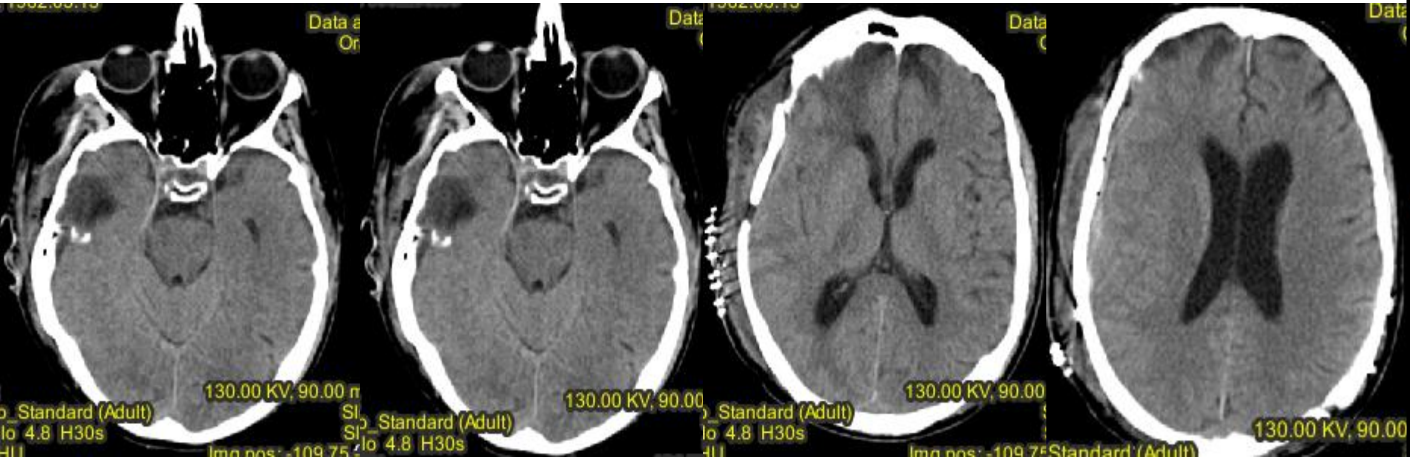
Awake, collaborating, left upper monoparesis (4/5)

No pneumonie – No sepsis - Rectal Klebsiella colonization

Stable ventricular enlargement

Mild Frontal syndrome

AUTOLOGOUS CRANIOPLASTY



CRANIOPLASTY AS SOON AS POSSIBLE

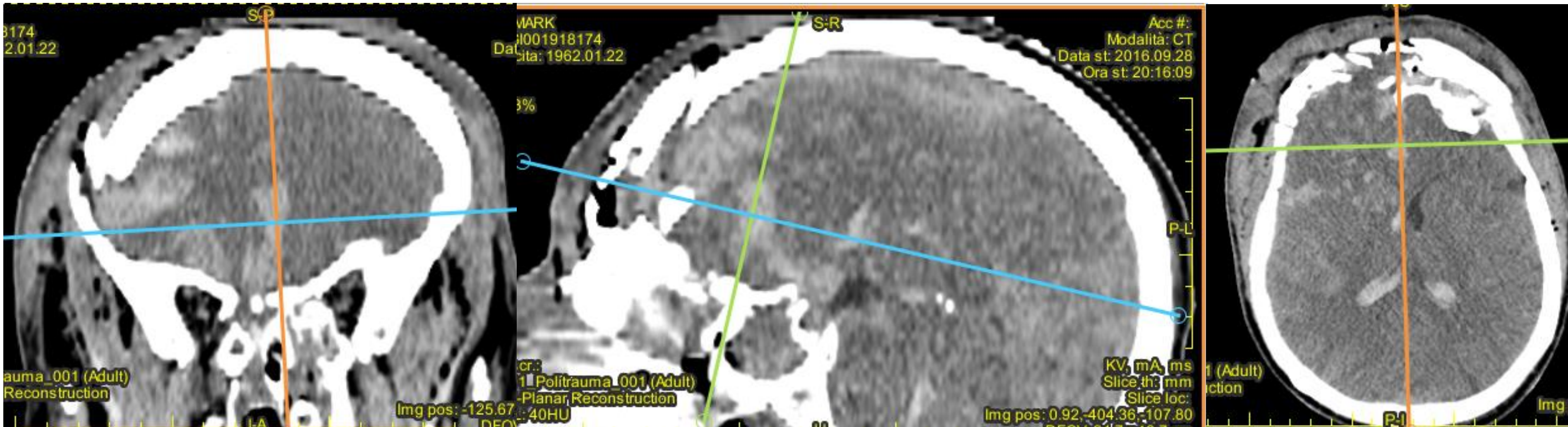
POSSIBLE= No oedema, No Brain swelling, No sepsis

MB, 54 y ♂ , Fall

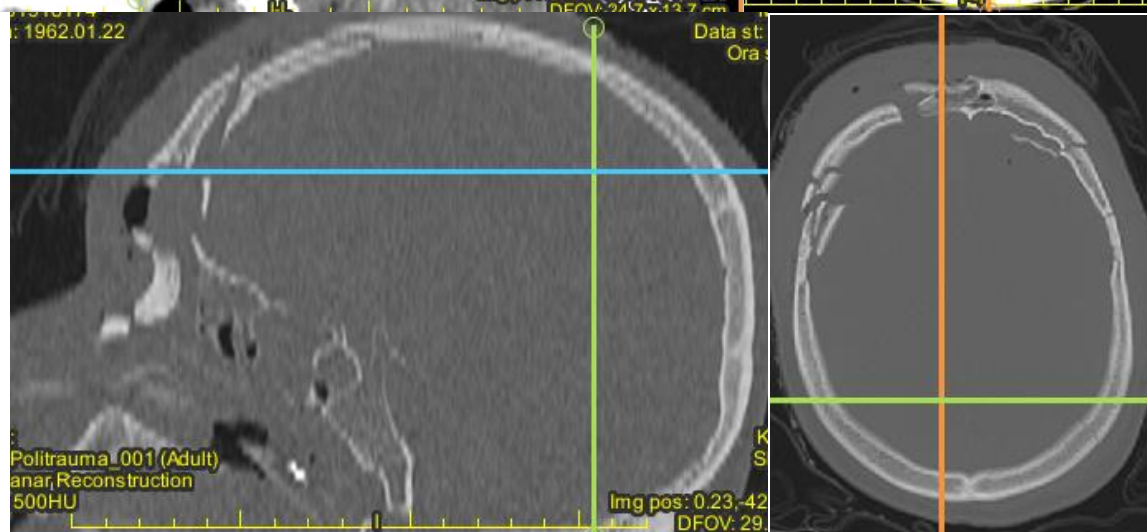
GCS 7 on scene, OTI standard sedation in ER

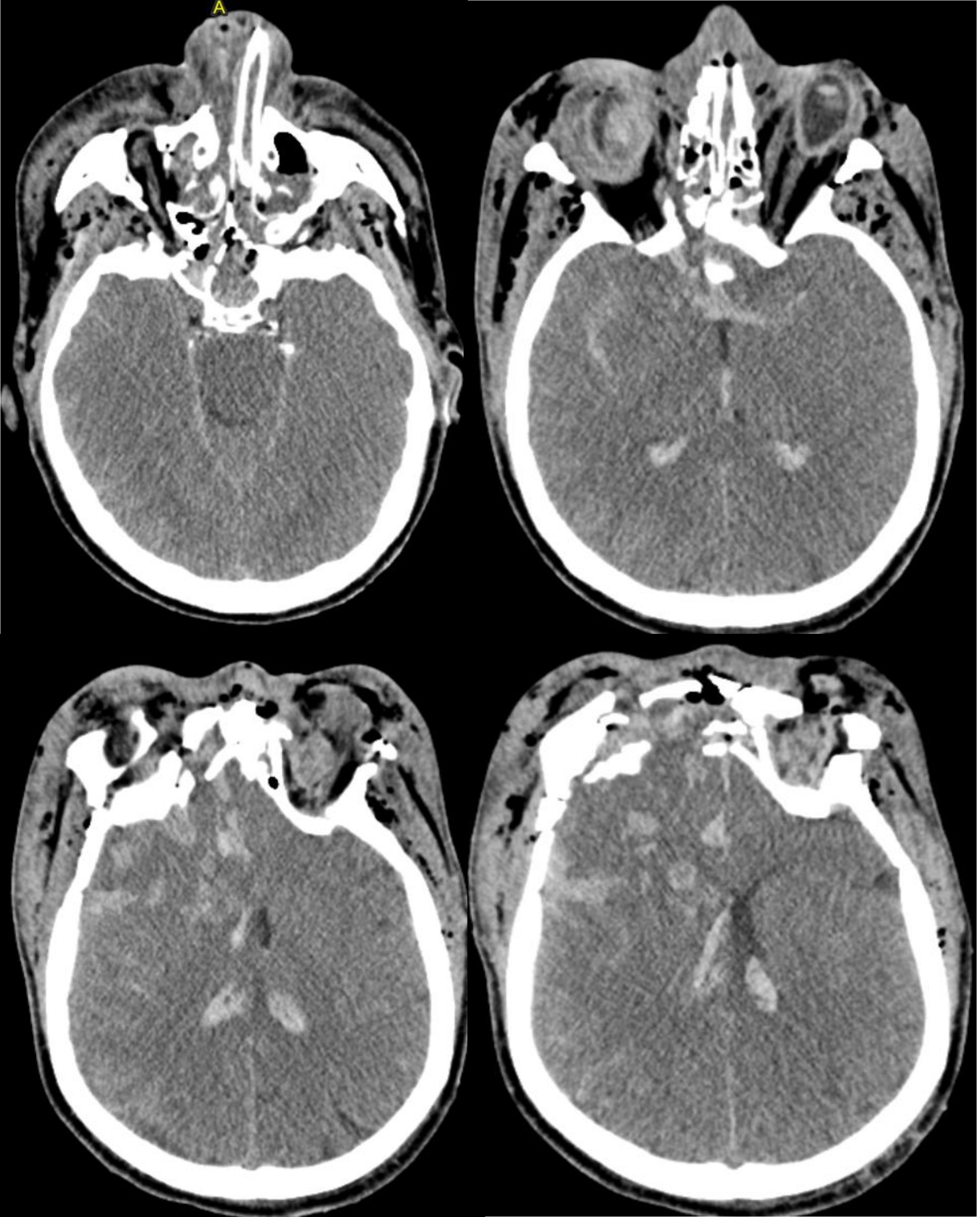
Fractures: Frontal, L parietal, orbit, ethmoid, sphenoid, dorsum sellae, R maxillar, L zygomus, L occipital, ESAt, IVH.

Frontal hypodensity



D4, D5 Fractures





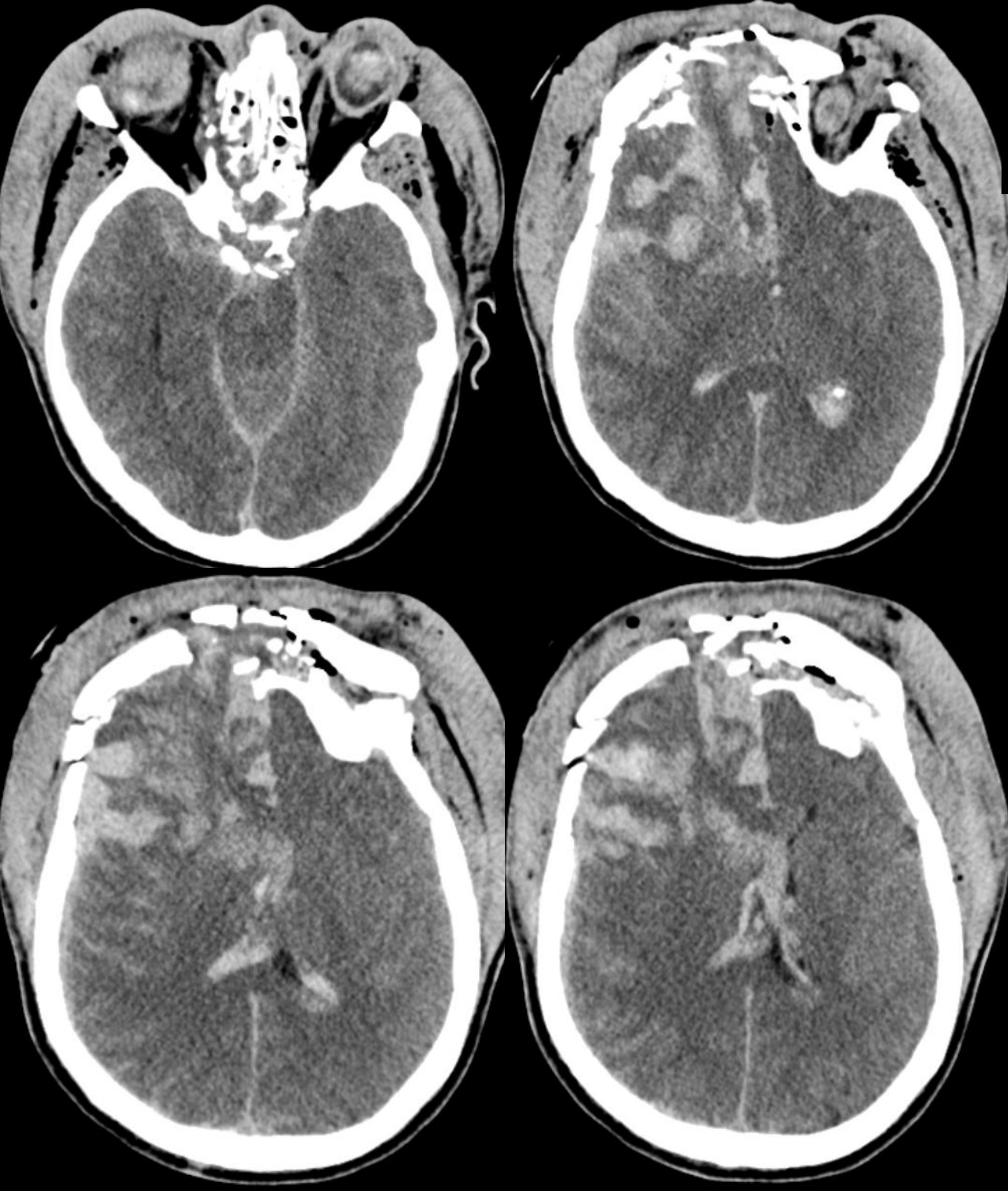
ICU management

- Bedside posterior nasal packing
- No cough reflex
- GCS 3 (*Short half-life sedation >1h*)
- **ICP 60 mmHg**
- ↑↑ Sedation level

CT scan

≠

Clinical signs

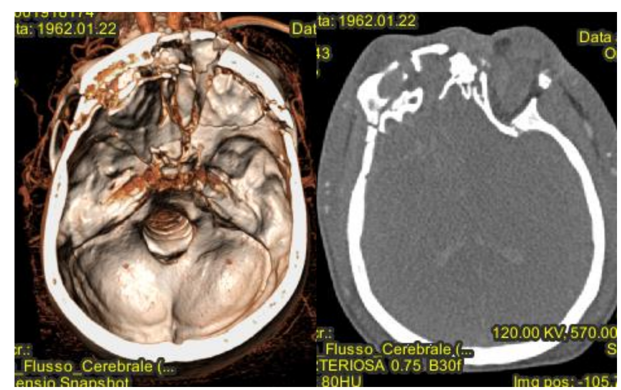


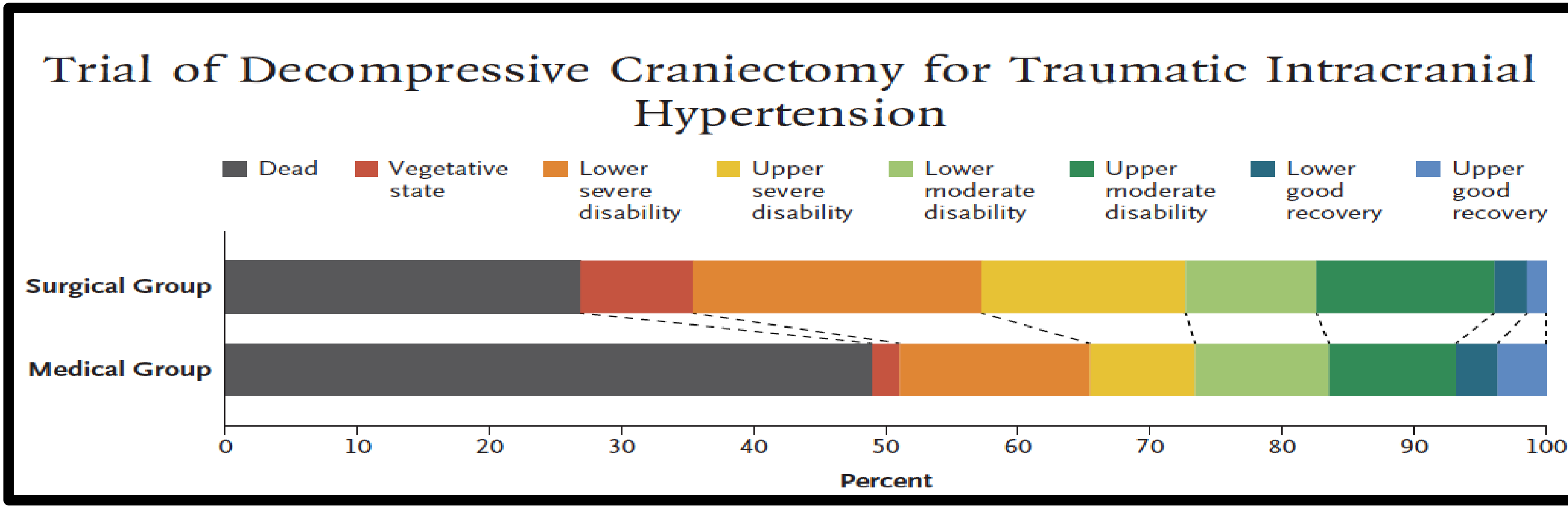
II CT scan = Clinical signs

- Volume progression
- Diencephalic and brainstem involvement
- GCS 3
- No Cough reflex
- ICP 50 mmHg

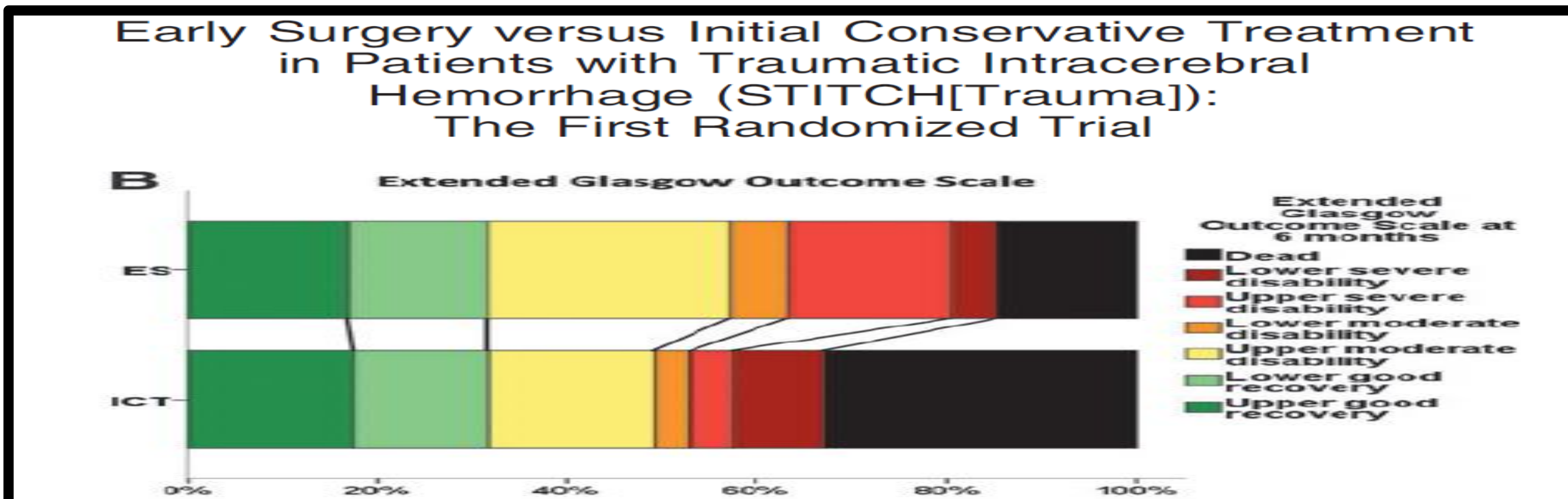
{ WITHDRAWAL NS – NI decision }

NO CBF after 72h





UPDATE ABOUT SURGICAL DECISION ON BRAIN CONTUSION?



ICP AFTER SURGERY?

Last controversies

Intracranial Traumatic Hematoma

Evacuation plus decompression

SPECULATIVE CONSIDERATIONS

-The question is not how high the ICP is but why is it happening

-Targeting the number may prevent death from herniation but will not affect the fate of injured neurons

RESEARCH CONSIDERATIONS

The extent, severity, and time-course of HICP following decompressive surgery are unclear, deserve further research: - To assess effectiveness
- To guide further therapy

PRACTICAL CONSIDERATIONS

If an intraparenchymal ICP probe is used:

- insertion under direct vision intra-operatively and tunnelled under the scalp (suggested choice)
- Leave the controlateral preop insertion via a bolt device (when available)

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ORIGINAL ARTICLE - BRAIN INJURY

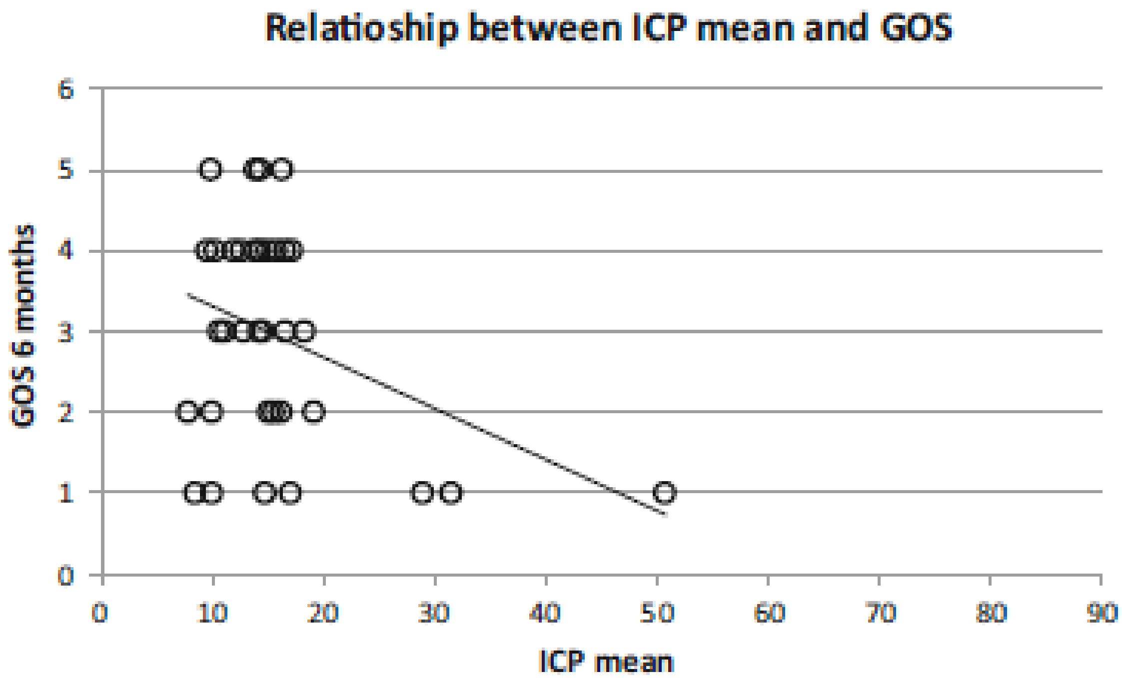
Intracranial pressure monitoring after primary decompressive craniectomy in traumatic brain injury: a clinical study

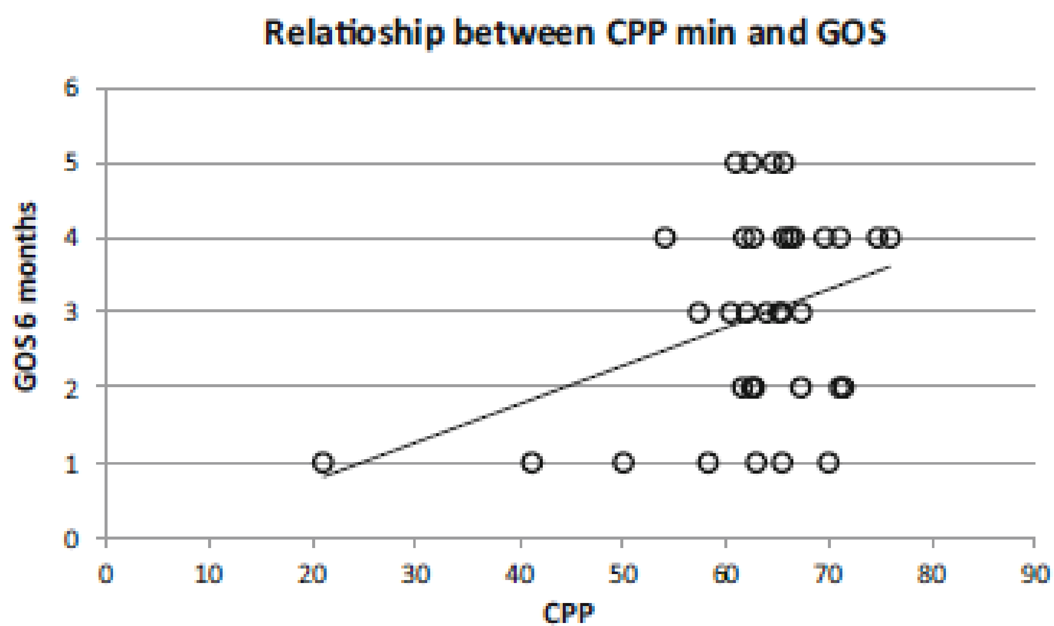
Edoardo Picetti[1] · Maria Luisa Caspani[1] · Corrado Iaccarino[2] · Giulia Pastorello[2] · Pierpaolo Salsi[3] · Edoardo Viaroli[2] · Franco Servadei[2]

our study was performed to elucidate the clinical utility of ICP monitoring following DC.

Population (n)	34
Age (mean ± SD)	51.3 ± 21.0
Sex [n (%)]	
Male	21 (61.8)
Female	13 (38.2)

Type of lesion removed [n(%)]	
contusion	6 (17.6)
EDH	2 (5.9)
SDH	12 (35.3)
SDH + contusion	11 (32.4)
SDH + EDH	2 (5.9)
SDH + temporal polectomy	1 (2.9)

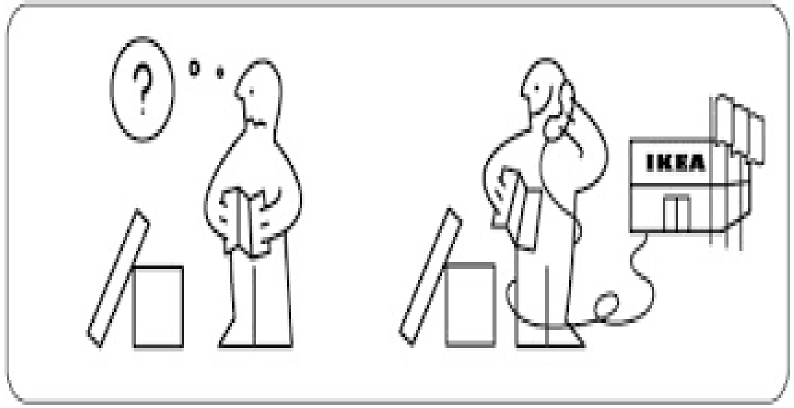

Relatioship between ICP mean and GOS
GOS 6 months
ICP mean
0
1
2
3
4
5
6
0
10
20
30
40
50
60
70
80
90


Relatioship between CPP min and GOS
GOS 6 months
CPP
0
1
2
3
4
5
6
0
10
20
30
40
50
60
70
80
90

After primary decompressive craniectomy the ICP monitoring was useful for:

- Guiding osmotherapies (34 pts)
- Guiding barbiturate coma (7 pts)
- Indicating an EVD placement (4 pts)
- Suggesting a revision of DC's diameter (1 pts)
- Early recognition and management ofpostoperative hematoma (3 pts)

Our study has several important limitations. The number of patients is low, and only two centers (with the same neurosurgical equipment and staff) were involved. In addition, this study represented a retrospective analysis of prospectively collected data. A multicenter, prospective, observational study with many patients is warranted to confirm our results.



- Avoid to transform survival in disability
- Mismatch clinical, neuroradiological and neuromonitoring data
- An awake patient and a comatous patient could have no benefit from a surgical evacuation of a brain contusion
- If you believe in the removal of bone flap after aSDH evacuation, please partecipate to the aSDH Rescue trial
- If you do not believe in the removal of bone flap after aSDH evacuation, please partecipate to the aSDH Rescue trial
- Preoperative ICP monitoring is indicated when there is a serious concern for the risk of herniation
- Postoperative ICP monitoring is indicate to drive medical and surgical decisions and to collect speculative data

THE LACK OF EVIDENCE IS DUE NOT TO LACK OF EFFECTIVE THERAPIES BUT TO REDUCED PROSPECTIVE LARGE SERIES STUDIES

Neurosurgery 0:1–10, 2016

Guidelines for the Management of Severe Traumatic Brain Injury, Fourth Edition

We think it is important to have evidence-based recommendations to clarify what aspects of practice currently can and cannot be supported by evidence, to encourage

- *Use of evidence-based treatments that exist*
- *Creativity in treatment and research in areas where evidence does not exist*