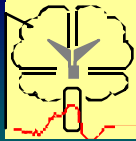


I POTENZIALI EVOCATI NEL COMA



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EPs IN SEVERE HEAD INJURY: Literature

Prevailing agreement on EP effectiveness in the
early prognosis of post-traumatic coma



Different patient selection, test timing, methods
for EP recording and grading criteria



Contradictions, discrepancies and conflicting results

EPs IN NEUROCRITICAL PATIENTS: Literature

- ❖ Strong evidence of prognostic value can be drawn from many papers
- ❖ Some authors believe that EPs can be useful only in sedated patients (e.g., Lindsay *K et al. Neurosurgery* 1990; 26:278-285).
- ❖ Others deny any ABR effectiveness (e.g., Anderson *et al. Arch. Neurol.* 1984; 41:369-374)

Prognostic power of SEPs in post-traumatic coma

Outcome	SEP Bilaterally Absent	SEP Unilaterally Absent	SEP Abnormal	SEP Normal
Good recovery, %	1 (0-1)	8 (0-16)	28 (20-36)	57 (49-65)
Moderate disability, %	3 (1-6)	10 (1-19)	29 (21-37)	22 (15-29)
Severe disability, %	95 (88-98)	35 (20-50)	30 (13-37)	10 (5-15)
FVS or death, %	95 (88-98)	48 (33-63)	22 (15-29)	11 (6-16)
Total no.	232	40	120	151

CI in brackets

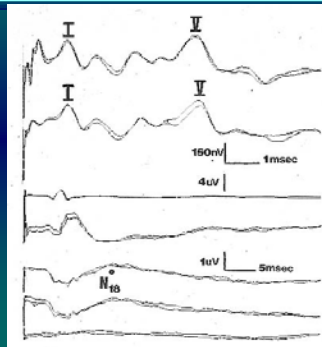
From Robinson *et al. Crit. Care Med.* 2003;31:960-7

Prognostic power of SEPs in postanoxic coma

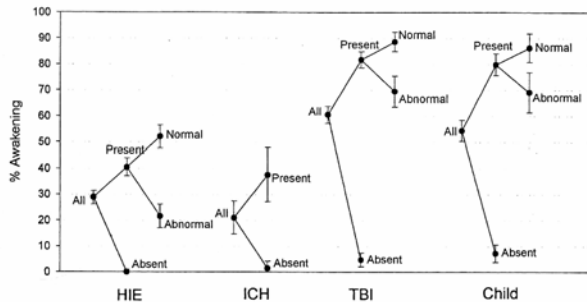
Outcome	SEP Absent	SEP Abnormal	SEP Normal
Good recovery or moderate disability, %	!!!	8 (3-13)	57 (47-67)
Severe disability, %		18 (11-25)	11 (5-17)
PVS or death, %	100 (99-100)	74 (66-82)	32 (23-41)
Total no.	336	104	98

From Robinson et al. Crit. Care Med. 2003;31:960-7)

ABR & SEP nel coma postanossico



Prognostic power of SEPs in coma



From Robinson et al. Crit. Care Med. 2003;31:960-71

Operator-Dependent Factors Affecting EPs Reliability

❖ Methods of recording

- ❖ Reference, Number of channels, frequency of stimulation

❖ Grading of EPs abnormalities

- ❖ Capability of detecting the "point-of-no-return"

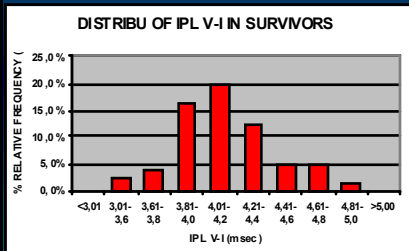
❖ Single Vs. Multimodality

- ❖ Looking for the best modality or combined analysis

❖ Test timing

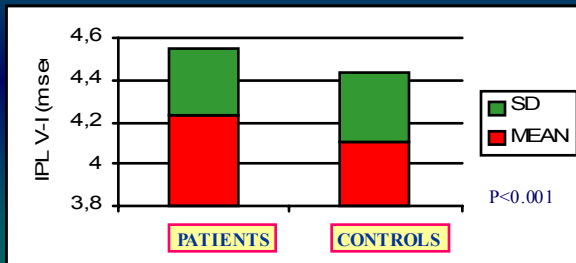
- ❖ False negative → True positive and vice versa

DISTRIBUTION OF IPL V-I IN SURVIVORS

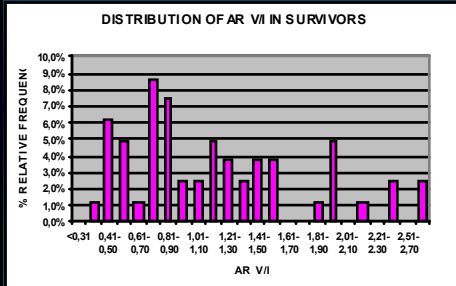


Gaussian distribution
 Mean = 4.15 msec
 SD = 0.30 msec
 95% of survivors in the range:
 3.70 < IPL V-I < 4.75 msec (mean \pm 2SD).

ABRs IN SEVERE HEAD INJURY IPL V-I IN SURVIVORS

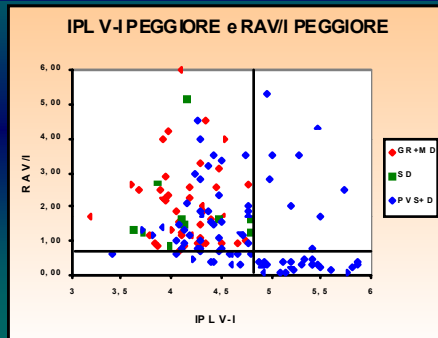


DISTRIBUTION OF AR-V-I IN SURVIVORS

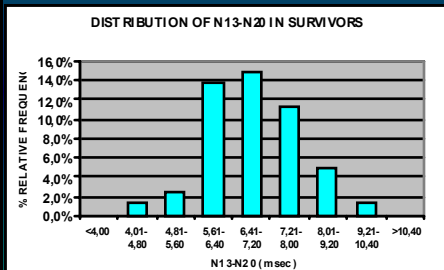


- No evidence of Gaussianity
- $AR = 0,5$ as empirical limit between survival and death

RELATIONSHIP BETWEEN IPL V-I E AR V/I



DISTRIBUTION OF N13-N20 IN SURVIVORS



Gaussian distribution

Mean = 6.31

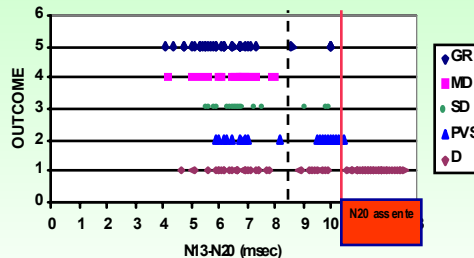
SD = 1.09

95% of survivors in the range:

$4.13 < N13-N20 < 8.49$ msec (mean \pm 2SD).

RELATIONSHIP BETWEEN BETTER N13-N20 AND OUTCOME

N13-N20 MIGLIORE ed OUTCOME



GRADING OF EVOKED POTENTIALS IN SEVERE HEAD INJURY

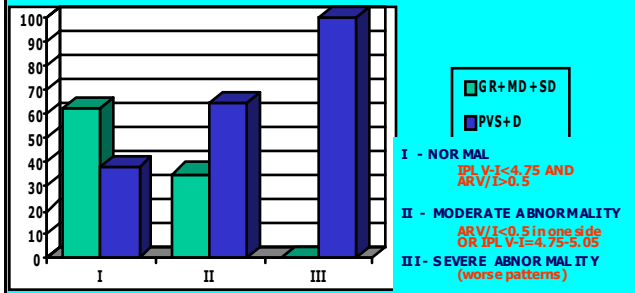
ABRs

- IPL V-I ≤ 4.75 msec
- IPL V-I > 4.75 msec
- IPL V-I = 4.76-5.05 msec
- AR V/I ≥ 0.5 msec
- AR V/I < 0.5 msec
- ABSENT WAVE V

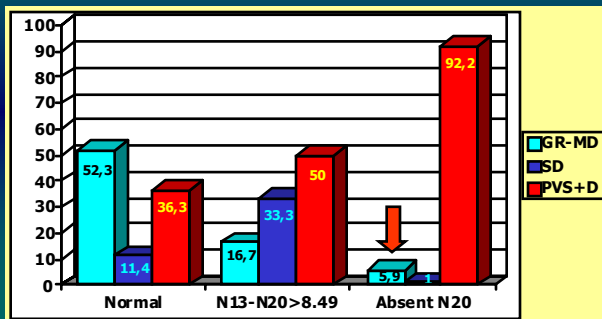
SEPs

- NORMAL SEPs
- N13-N20 > 8.49 msec
- ABSENT N20

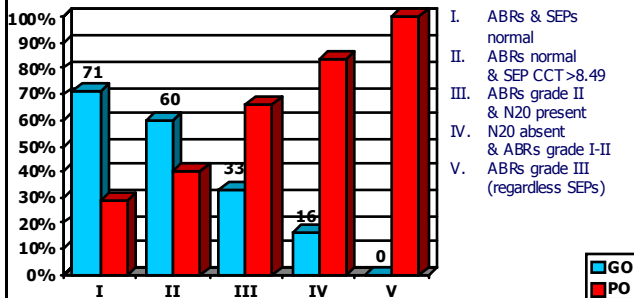
ABRs AND OUTCOME IN SEVERE HEAD INJURY



RELATIONSHIP BETWEEN SEPs AND OUTCOME

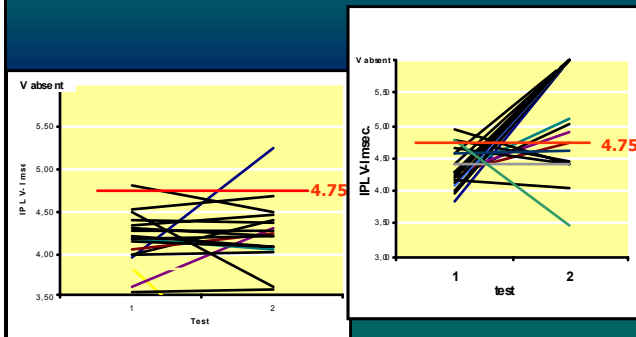


EP GRADING



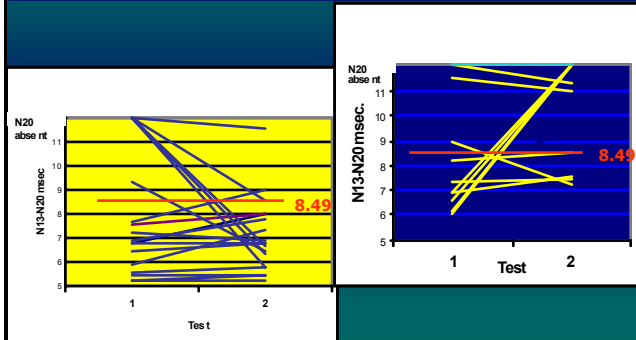
SERIAL ABRs – IPL V-I

GOOD OUTCOME



SERIAL SEPs – N13-N20

GOOD OUTCOME



RELATIONSHIP BETWEEN GCS, EPs AND OUTCOME

OUT COME	GCS				TN = 51 TP = 69 FN = 13 FP = 12 Errors = 25 X ² = 58.624 P < 0.001 Se = 84% Sp = 80% PP = 85% RR = 22.5
	5-8		3-4		
	EP Normal	Abnormal	EP Normal	Abnormal	
	N.	(%)		N.	(%)
GR+MD	79.7	24.9	30.8	-	
SD				1 (2.5)	
PVS	20.3	75.1	2 (15.4)	6 (15.0)	
D			7 (53.8)	33 (82.5)	
TOTALE	64 (100.0)	28 (100.0)	13 (100.0)	40(100.0)	

ABRs in cerebral hemorrhage

	MEAN	SD	
CONTROLS	4.03	0.17	F = 30.56
			P < 0.001
SURVIVORS	4.27	0.24	t = 3.739*
			P < 0.001
PVS + DEATHS	4.73	0.45	t = 4.411**
			P < 0.001

* = Controls vs. Survivors; ** = Survivors vs. PVS+Death

Prognostic power of SEPs and ABRs in coma due to cerebral hemorrhage.

PATIENTS	SEPs Better side	SEPs Worse side	SEPs or ABRs abnormal
TRUE NEG.	20	14	19
FALSE POS.	1	7	2
TRUE POS.	36	41	47
FALSE NEG.	13	8	2
P<	0.001	0.001	0.001
REL. RISK	55	10	223
SENSITIVITY	73	83	96
SPECIFICITY	95	67	90
P.P.	97	85	96

Prognostic Power of GCS in Cerebral Hemorrhage

	GO No. of Cases (%)	PO No. of Cases (%)	
GCS = 5-8	19 (48.7)	20 (51.3)	P<0.001 RR = 14 Se = 59
GCS = 3-4	2 (6.5)	29 (93.5)	Sp = 93 PP = 93

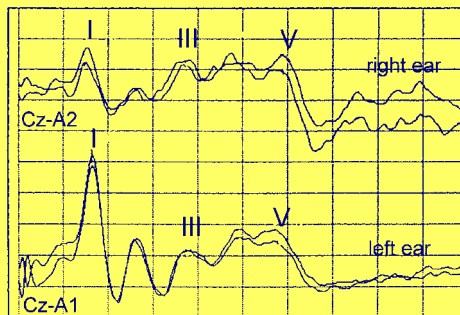
Relationship between SEPs and quality of survival

	NORMAL SEPs	UNILATERAL INCRERASE OF N13-N20	UNILATERAL ABSENCE OF N20	BILATERAL ABSENC E OF N20
	No. (%)	No. (%)	No. (%)	No. (%)
GR	9 (100)	0 -	0 -	0 -
MD	4 (57.1)	0 -	2 (28.6)	1 (14.3)
SD	1 (20)	1 (20)	3 (60)	0 -

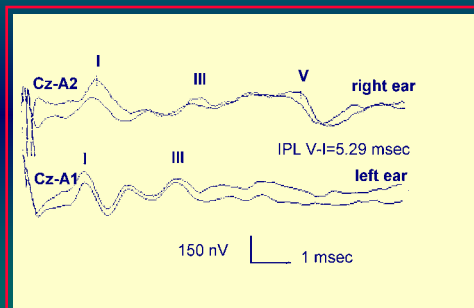
Exact Fisher's Test
P*=0.024

* tested for GR + MD vs. SD and normal SEPs
vs. unilaterally + bilaterally abnormal SEPs.

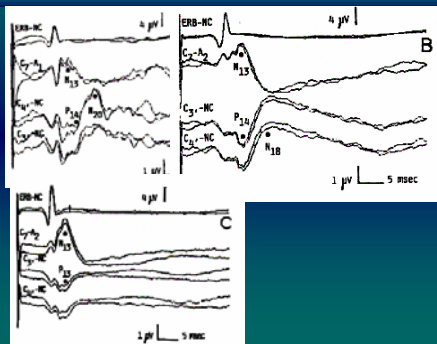
ABR & Head Injury



ABR & Head Injury



SEP IN SEVERE HEAD INJURY

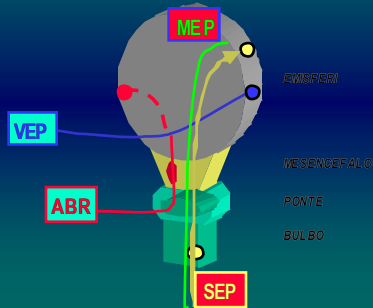


- ❑ I PE sono significativamente correlati alla prognosi
- ❑ Una corretta classificazione dei PE consente di ridurre la percentuale di errore
- ❑ La combinazione di GCS e PE è in grado di migliorare il giudizio prognostico rispetto all'uso di un solo parametro
- ❑ Il monitoraggio seriato dei PE durante la fase acuta del decorso clinico aumenta e riduce il numero di errori

CONCLUSIONI

- ❑ I valori utili per la classificazione dei PE nel coma post-traumatico e vascolare sembrano:
 - IPL V-I > 4,75 msec
 - IPL V-I = 4.75- 5.05 msec
 - RA V/I < 0,5
 - IPL V-I > 5.05 msec o assenza onda V
 - N13-N20 > 8,49 msec
 - assenza N20.
- ❑ **Questi valori non sono immutabili, ma possono variare in seguito all'evoluzione del trattamento di queste condizioni morbose.**

POTENZIALI EVOCATI



Subjective and Semantic Factors Affecting EPs in NICU

- ☐ Meaning of EP abnormalities in terms of prognosis
- ☐ Meaning of the term “prognosis” in the early stage
 - Increased risk of poor outcome
 - Certainty of poor outcome
- ☐ Optimistic or pessimistic disposition of both neurophysiologist and Intensivist
 - Increased therapeutic efforts
 - Treatment withdrawal

NEED FOR CONSENSUS ON THE MEANING OF THE TERMS USED

Subjective and Semantic Factors Affecting EPs in NICU

