

뇌혈관 예비능 측정에 있어서 Acetazolamide SPECT와 Dipyridamole SPECT의 비교*

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= Abstract =

Comparison between Acetazolamide and Dipyridamole Activated SPECT for Cerebral Vascular Reserve Capacity Measurement

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Object of this study was to make comparison between acetazolamide and dipyridamole activated SPECT for measurement of cerebral vascular reserve capacity. This study was also carried out to evaluate response in acetazolamide and dipyridamole activated SPECT in relation to clinical parameters, such as Glasgow Coma Scale, Hunt & Hess grade, Fisher grade and Glasgow Outcome Scale. It is concluded from study that.

Acetazolamide and dipyridamole activated SPECT study proved to be valuable for cerebral vascular reserve capacity. Dipyridamole activated SPECT study was somewhat equivocal because of systemic vascular dilatation effect, but this problem could be resolved by Gamma Count Ratio. Although there were minimal transient side effect of dipyridamole such as dizziness, no complication.

KEY WORDS : Dipyridamole SPECT · Acetazolamide SPECT · Cerebral vascular reserve capacity · Subarachnoid hemorrhage.

서 론

Triple - H(hypervolemic hemodilution, hypertensive therapy)

가²⁸⁾

1997

(cerebral activation studies)

vasoparalysismide 가 . acetazolamide

가 가 가 (cerebral vascular vasodilatory reserve capacity, VRC)

. Shinoda²³⁾ 1991

(delayed ischemic change) SPECT

가 , 가
 .
 , 가 ac-
 etazolamide myocardial
 SPECT (coronary flow reserve)
 가 dipyridamole
 acetazolamide activated
 SPECT ,
 가

대상 및 방법

41 .
 acetazolamide (30), di-
 pyridamole (11) . Acetazolam-
 ide 1993 12 1997 9
 9 , 21 55 . Dipyri-
 damole 1996 11 1997 9
 5 , 6 48 .
 3
 SPECT
 , 4
 .
 SPECT 3 15
^{99m}Tc HMPAO 20mCi , 30
 (Sopy DS7, Sopa Medical)
 (orbitomeatal line)
 , ,
 SPECT 1 2 . Ac-
 etazolamide acetazolamide 1.0g , 20
 20mCi ^{99m}Tc HMPAO . Dip-
 yridamole
 1 dipyridamole
 0.14mg/kg/min 4 , 3 20m
 Ci ^{99m}Tc HMPAO . Dipyridam-
 ole 10 가 (vital signs)
 . Acetazolamide dipyridamole SPECT
 .
 Acetazolamide SPECT dipyridamole SPECT
 Gla-
 sgow Coma Scale(GCS), Hunt & Hess grade, Fisher

grade acetazolamide SPECT dipyridamole SP-
 ECT 가 (Gla-
 sgow Outcome Scale, GOS)
 .
 SPECT 1
 , SPECT
 가
 10% 가 가
 . acetazolamide SPECT dipyrid-
 amole SPECT
 SPECT
 , 30% 가 가
 가
 Dipyridamole SPECT
 .
 (gamma count ratio)
 basal activated SPECT
 .
 Gamma count ratio = average counts per pixel of the
 ROI/average counts per pixel of a part of normal perf-
 usion in Cbll
 Ke-
 ndall's tau - b, Spearman's correlation

결 과

1. 내원당시의 GCS와 환자 예후(GOS)의 비교(Table 1)
 GCS가 15 23 GOS가 5
 18 (78%) , GOS가 4 2 (9%), GOS
 2 3 (13%) GCS
 (p<0.05). GCS
 15 GOS 2 가
 vasospasm .
 2. 내원당시 Hunt & Hess grade와 예후(GOS)의 관계
 (Table 2)
 Hunt & Hess grade 1 3 GOS 5
 Hunt & Hess grade 2 23 GOS 5 14
 (60%) , GOS 4 5 (22%), GOS 2 3 (13%),
 GOS 1 1 (5%) , Hunt & Hess grade
 (p<0.05).

Table 1. Comparison between GCS and GOS (n = 41)

GOS	GCS	5	6	7	8	9	10	11	12	13	14	15
1					+				+		+	
2						+						+++
3								+++				
4		+			+		+	+	+		+	++
5								++		+	++	++++
												++++
												+++

GCS = Glasgow Coma Scale, GOS = Glasgow Outcome Scale

Table 2. Comparison between Hunt-Hess grade and GOS (n = 41)

GOS	Hunt-Hess	1	2	3	4
1			+	+	+
2			+++	+	
3				+++	
4			+++++	++	+
5		+++	+++++	+++++	+
			+++++	+	
			+++++		

Table 3. Comparison between Fischer grade and GOS (n = 41)

GOS	Fischer	1	2	3	4
1		+		+++++	
2					+
3				++	+
4			++++	+++	+
5		++	+++++	+++++	+++
			+++++	+++	

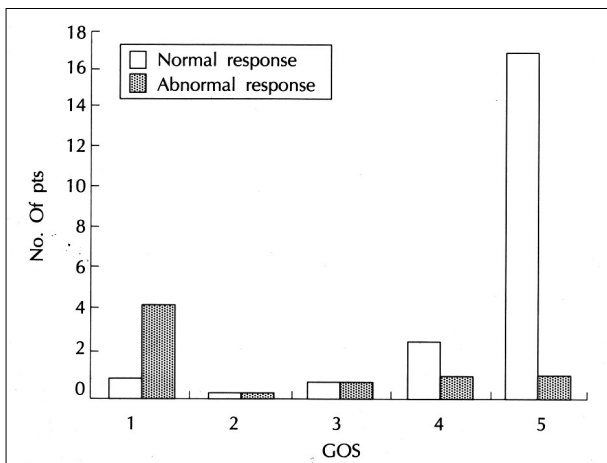


Fig. 1. Relationship between acetazolamide SPECT response and prognosis(GOS). A statistically significant is correlation between acetazolamide SPECT and GOS ($p < 0.005$, Kendall's tau-b test).

Hunt & Hess grade 2, GOS 2 4

3. 내원당시 Fisher grade 와 예후(GOS)(Table 3)

Fisher grade GOS
($p > 0.05$).

4. SPECT result와 예후(GOS)의 관계 (Fig. 1, 2)

Acetazolamide dipyridamole SPECT
($p < 0.05$).

가, Acetazolamide
8 5 (62%) GOS 1

(Fig. 1, 6), dipyridamole

5 GOS 4 3 (60%), GOS 3 1 (20%), GOS
2 1 (20%) (Fig. 2, 8).

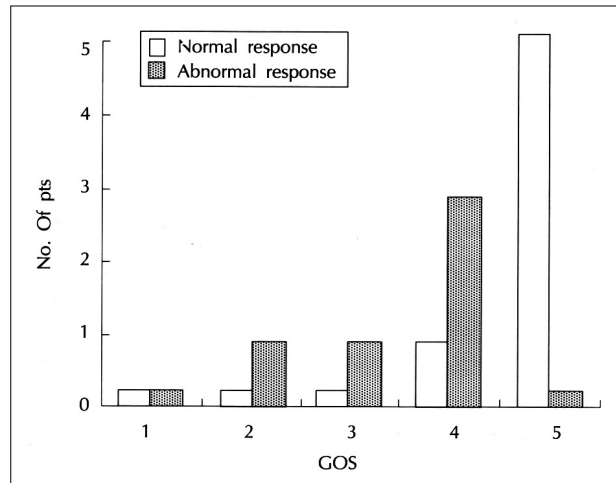


Fig. 2. Relationship between acetazolamide SPECT response and prognosis(GOS). There is correlation between dipyridamole SPECT and GOS ($p < 0.005$, Kendall's tau-b test).

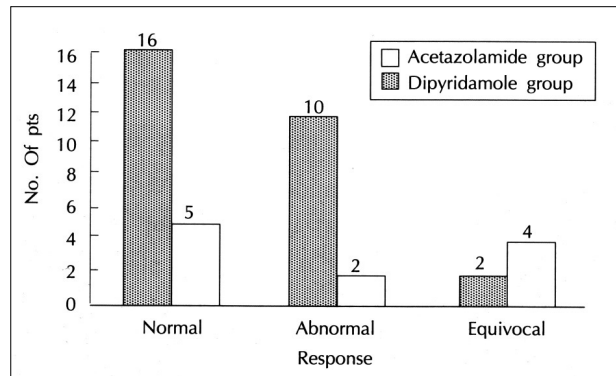


Fig. 3. Comparison of activated SPECT response examined with naked eye. The dipyridamole group show relatively high equivocal response than acetazolamide group which might be largely due to pharmacologic effect of dipyridamole.

5. 육안관찰과 방사능 계수(gamma count)의 비교(Fig. 3, 4)

acetazolamide 30
2 (7%)

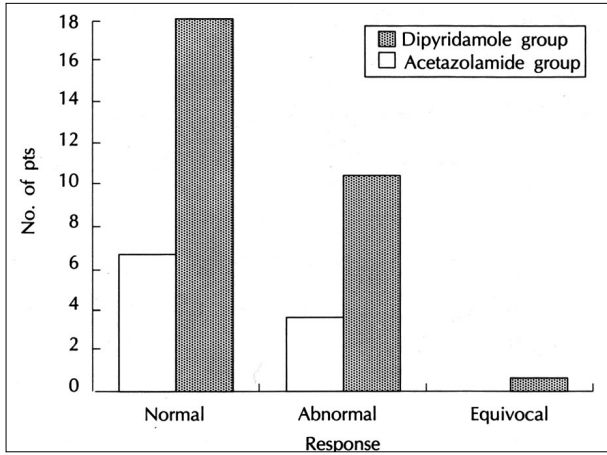
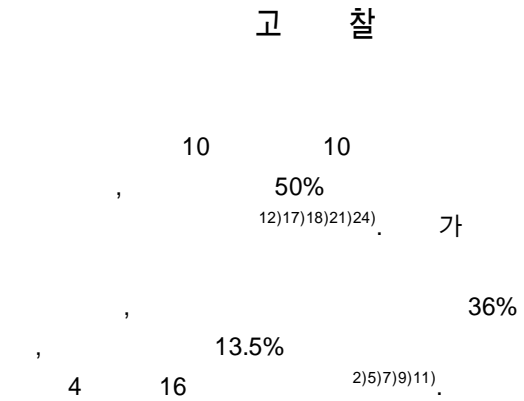


Fig. 4. Comparison of activated SPECT response examine with Gamma count ratio. The equivocal cases, shown in figure 3, can be interpreted with Gamma count ratio, especially in dipyridamole group.

dipyridamole 11 4 (36%)

Fig. 3

1 가
dipyridamole
(Fig. 4).



가

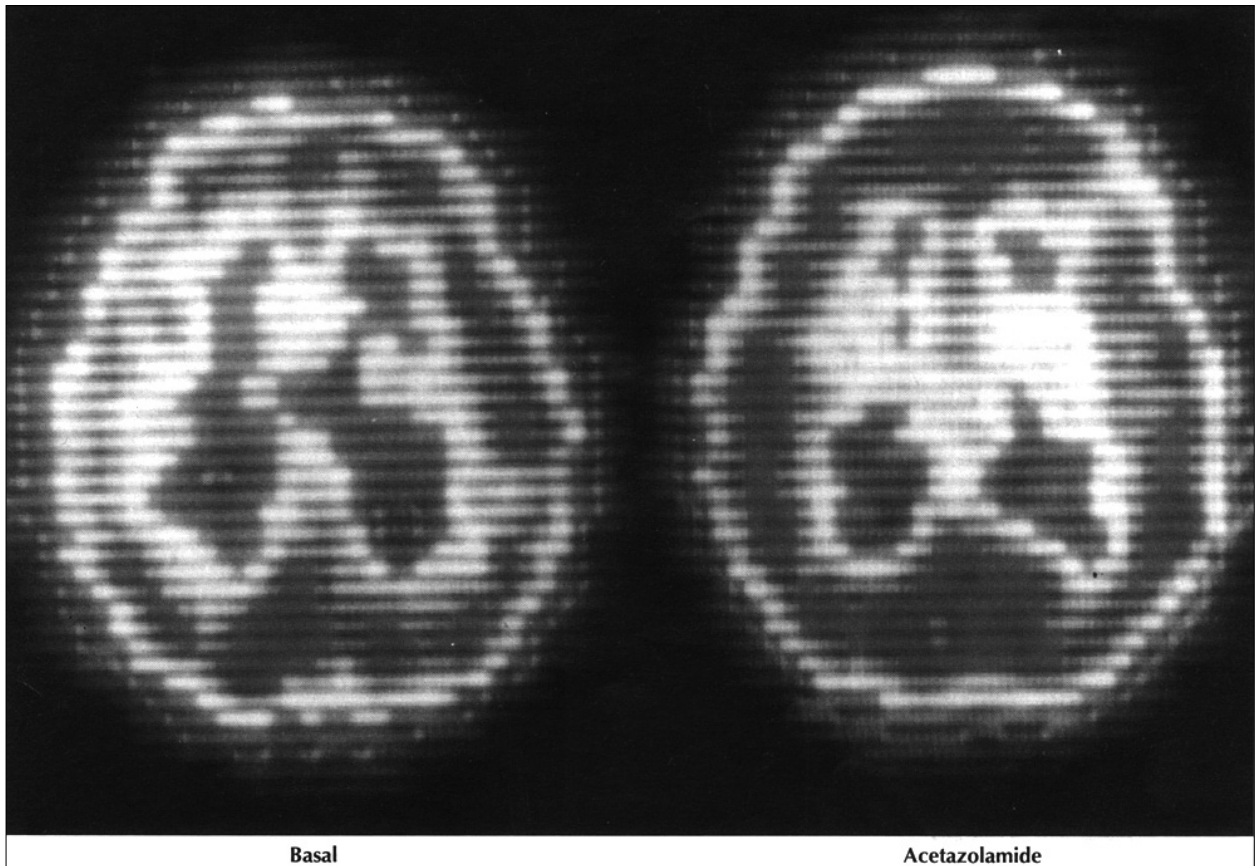


Fig. 5. Normal response of acetazolamide SPECT. The basal SPECT showed decreased CBF at frontotemporal area. The acetazolamide SPECT showed normal response with increased CBF.

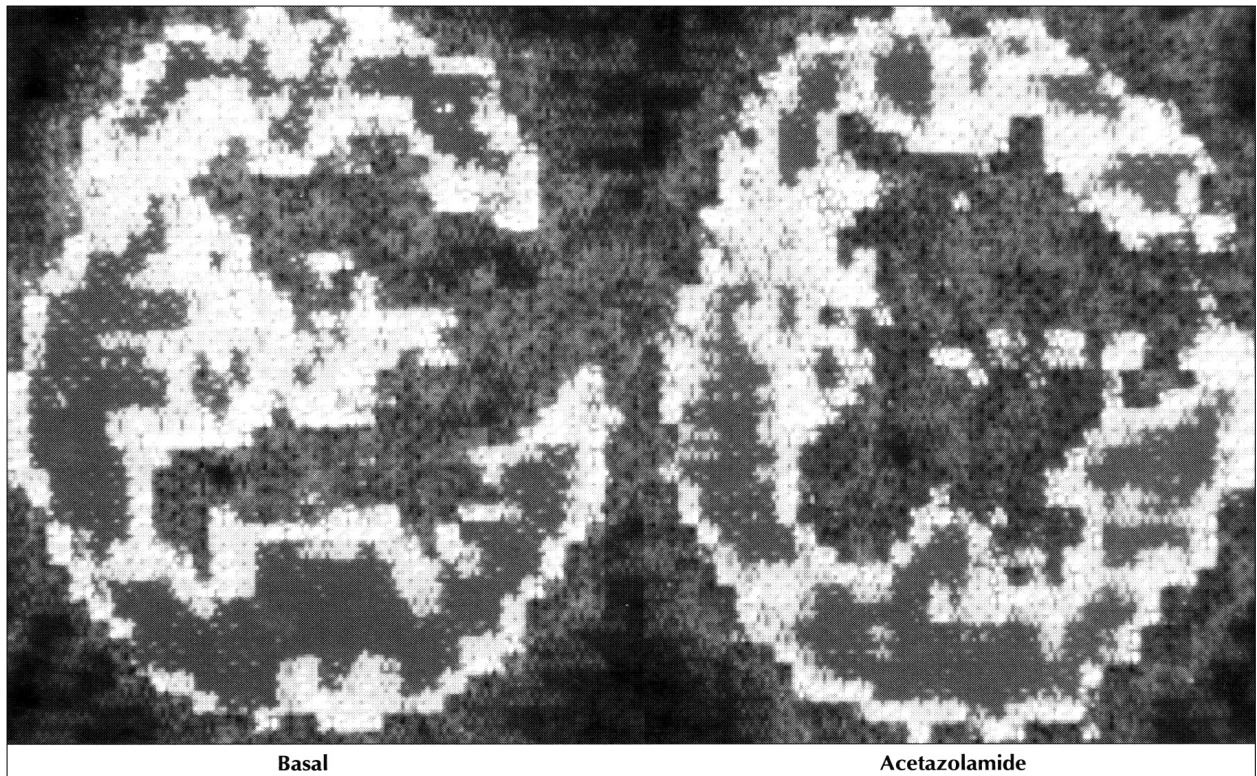


Fig. 6. Abnormal response of acetazolamide SPECT. The CBF which decreased at the left frontotemporal area in basal SPECT did not increase after the administration of acetazolamide.

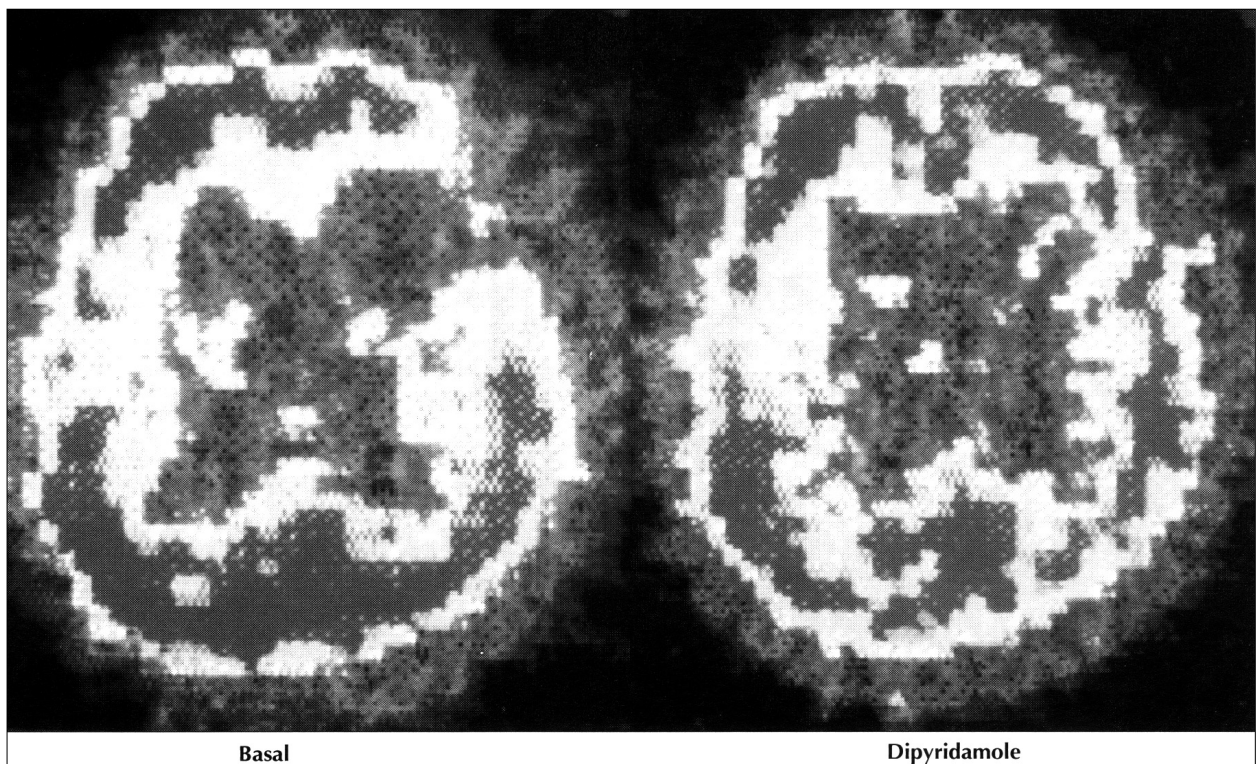


Fig. 7. Normal response of dipyridamole SPECT. The CBF which decreased at the left frontotemporal area in basal SPECT increased after the administration of dipyridamole.

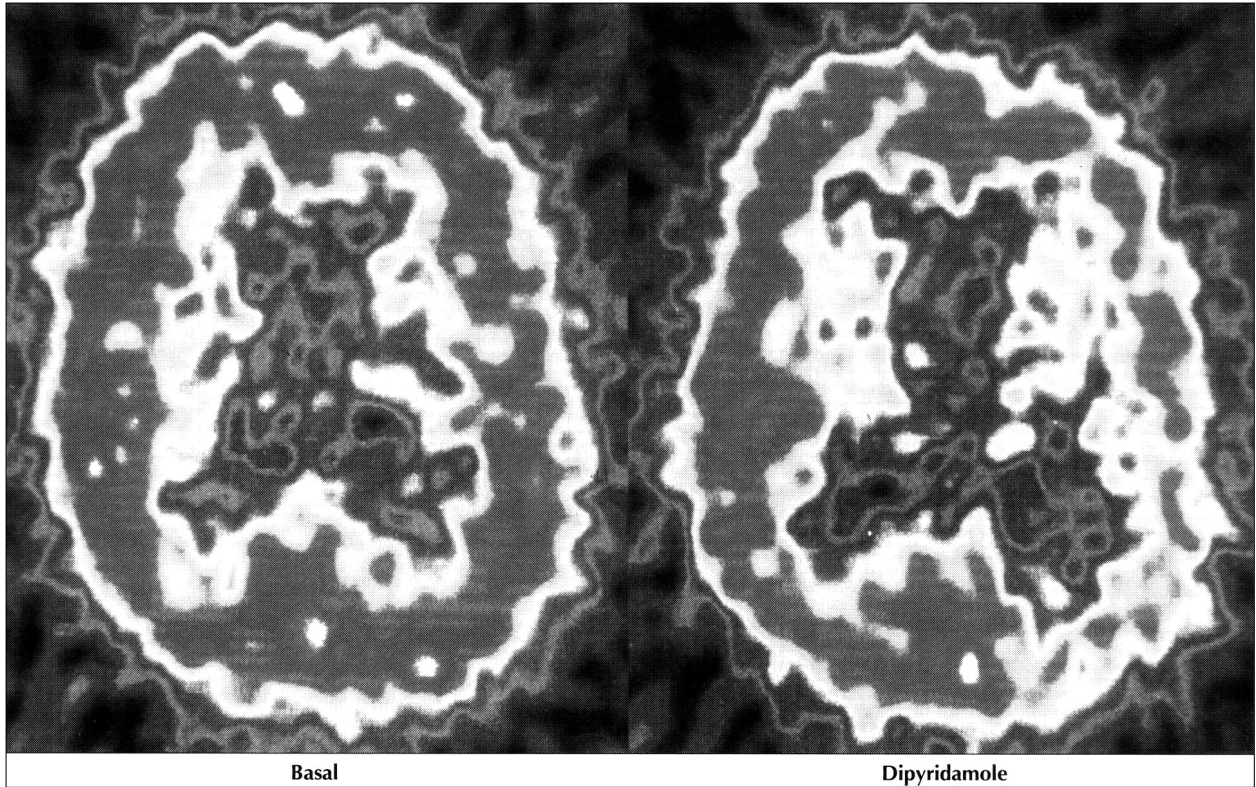


Fig. 8. Abnormal response of dipyridamole SPECT. In comparison with the basal SPECT, the dipyridamole SPECT showed hyperperfusion at left frontoparietal area.

Triple - H (Hypervolemic Hemodilution, Hypertensive Therapy) 가 Triple - H (cerebral perfusion pressure) 가 Takeuchi 26) hydrogen clearance technique cerebral blood flow (autoregulation) 가 (arterial blood pressure) 가 가 가 (cerebral blood flow) Moyamoya 가 13)

Tiple - H (Hypervolemic Hemodilution, Hypertensive Therapy) 가 Triple - H (cerebral perfusion pressure) 가 Takeuchi 26) hydrogen clearance technique cerebral blood flow (autoregulation) 가 (arterial blood pressure) 가 가 가 (cerebral blood flow) Moyamoya 가 13)

¹³³Xe - CT , PET (Positron Emission Tomography), TCD (Transcranial Doppler), MRA, ^{99m}Tc HMPAO SPECT 가 "lookthrough" 가 (oxygen metabolism) 가 가 (velocity) 가 가 가 , 가 SPECT 가 SPECT 가

VRC = Stimulated CBF - Basal CBF (membrane permeability)

가 CO₂ acetaz- (systemic arterial pr -
olamide , essure) 20% , (peripheral vascular
, resistance) 31% , 213%
, Boarini 4) (cerebral vascular resistance) 21%

가 (peripheral pooling)

Kimura 14) acetazolamide 123I - IMP SPECT Fig. 3 acetazolamide SPECT
가 , dipyri -
damole SPECT 가가

acetazolamide dipyridamole SPECT SPECT Dipyridamole SPECT

가 CO₂ acetazolamide 가
. Acetazolamide acetazolamide
, carbonic anhydrase
, CO₂
. Shinoda 23) ace -
tazolamide 123I - IMP SPECT 가
가 dipy -
ridamole 가

. Fig. 1 acetazolamide SPECT

GOS 가
acetazolamide

SPECT study가

Hwang 10) dipyridamole SPECT

acetazolamide SPECT (sy -
. dipyridamole stolic pressure<100mmHg)
. Dipyridamole 4 ,
ade - 10 , EKG

nosin degradation adenosine deaminase
adenosine uptake adenosine

결 론

- 1) Acetazolamide dipyridamole activated SPECT (cerebral vascular reserve capacity) 가
- 2) Dipyridamole activated SPECT 가 , 가 acetazolamide
- 3) dipyridamole
 - : 1998 6 30
 - : 1998 9 3
 - : 602 - 702 34
 - : 051) 240 - 6465, : 051) 248 - 2939

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