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NEUROBIOLOGICAL SUBSTRATE OF AUTISM SPECTRUM DISORDER - CEREBRAL BLOOD FLOW DISTRIBUTION OF ^{11}C-BUTANOL AS ASSESSED BY PET/CT

M. Pagani[1,2], I. Manouilenko[3], S. Stone-Elander[4], R. Odh[1], D. Salmaso[2], A.-M. Danielsson[1], R. Hatherly[1], H. Jacobsson[1], S.A. Larsson[1], **S. Bejerot**[3]

[1]Nuclear Medicine, Karolinska Hospital, Stockholm, Sweden, [2]ISTC, CNR, Rome & Padua, Italy, [3]Psychiatry, St. Göran's Hospital, [4]Karolinska Pharmacy and Dept Clin Neurosciences, Karolinska Institutet, Stockholm, Sweden

Background: Functional studies in Autism Spectrum Disorder (ASD) have shown localised focal hypoperfusion and abnormalities in the anatomo-functional connectivity of limbic-striatal "social" brain. However, no common regional abnormalities have been found across studies.
The aim of this study was to investigate the cerebral blood flow (CBF) at rest in subjects with ASD as compared to a group of healthy controls.

Methods: In this preliminary investigation six normal intelligence patients with ASD and 5 age and sex matched healthy controls (HC) were examined using PET/CT camera and, as CBF tracer, ^{11}C-butanol, a radiopharmaceutical produced on-site. The combination of these two methodologies reduced the whole examination time to less than 10 minutes. Statistical Parametric Mapping was implemented to analyse the data.

Results: As compared to HC, ASD showed a highly significant CBF increase (height threshold $p=0.001$, $p< 0.0001$ at voxel-level), bilaterally, in large portions of the cerebellum, of the visual associative cortex and of the posterior parietal lobe.

Conclusions: This preliminary study was performed by the state-of-the-art neuroimaging methodologies that reduced considerably the examination time and resulted in less stress and more reliable investigations. The occipital and parietal associative cortex as well as the cerebellum showed an increased CBF in ASD, underscoring their involvement in the disease and raising methodological and diagnostic issues to be considered when exploring the neuroanatomy of ASD.

Cerebral blood flow distribution in autism spectrum disorder – A ^{11}C- Butanol PET/CT study

I. Manouilenko[1], S. Stone-Elander[2], R. Odh[3], D. Salmaso[4], A.-M. Danielsson[3], R. Hatherly[3], H. Jacobsson[3], S.A. Larsson[3], S. Bejerot[1] , M. Pagani[3,4]

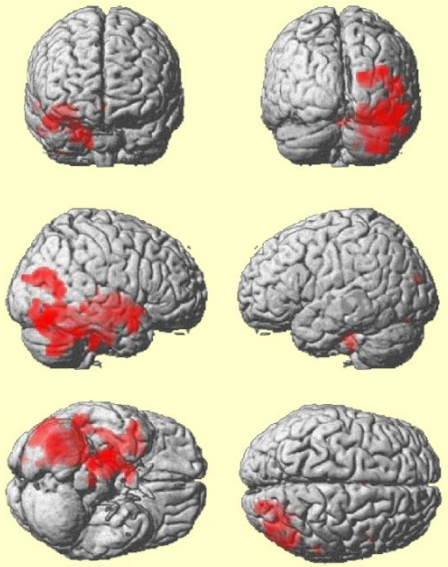
Background

Autism Spectrum Disorder (ASD) is regarded as an early onset behavioural syndrome but no biological markers have been established yet. Functional studies have shown localized focal hypoperfusion and abnormalities in the anatomo-functional connectivity of the limbic-striatal "social" brain. The aim of this study was to investigate the regional cerebral blood flow (rCBF) at rest in subjects with ASD as compared to a group of healthy controls.

Methods

Thirteen normal intelligence patients with ASD and ten healthy controls (HC) underwent PET/CT using [1-^{11}C]-butanol, a perfusion tracer produced from [^{11}C]carbon dioxide. The whole examination time was less than 10 minutes. Data were analysed by SPM ($p=0.05$ for voxel height, $p_{corrected}<0.001$ at cluster level and $p_{uncorrected} < 0.01$ at voxel level).

Cluster size	Zscore	p(unc)	x	y	z	
6408	2,990	0,001	16	-9	2	R Globus Pallidus
	2,880	0,002	32	-67	18	Posterior Cingulate BA31
	2,840	0,002	29	-64	-16	Cerebellum Posterior Lobe
	2,820	0,002	16	-29	-11	Cerebellum Anterior Lobe
	2,780	0,003	22	-14	-27	Parahippocampal Gyrus BA28, BA35
	2,750	0,003	31	3	-4	Putamen
	2,580	0,005	46	7	-12	Superior Temporal Gyrus BA38, BA13, BA21
	2,490	0,006	19	-76	14	Cuneus BA17, BA18, BA23
	2,460	0,007	45	-59	8	Middle Temporal Gyrus BA39
	2,410	0,008	47	-62	-13	Fusiform Gyrus BA37
	2,320	0,010	26	-64	9	Posterior Cingulate BA30



Regions in which rCBF is higher in ASD (n=13) as compared to HC (n=10).

Conclusions

Using state-of-the-art neuroimaging methodologies, reduced considerably the examination time resulting in less stress to these psychiatric patients and in robust results. The limbic and posterior associative cortices and cerebellum were found to have an increased CBF in ASD, underscoring their involvement in the disease and raising methodological and diagnostic issues to be considered when exploring the neuroanatomy of ASD.

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[1]Psychiatry, St:Göran's Hospital,[2]Karolinska Pharmacy and Dept Clin Neurosciences, Karolinska Institutet, Stockholm, Sweden, [3]Nuclear Medicine, Karolinska Hospital, Stockholm, Sweden, [4]ISTC, CNR, Rome & Padua, Italy