

10a Jornada de
Recerca de l'ICS

11a Jornada de
Recerca de l'IDIAP



La recerca amb
grans bases de
dades clíniques
millora la salut

7 de juny de 2018

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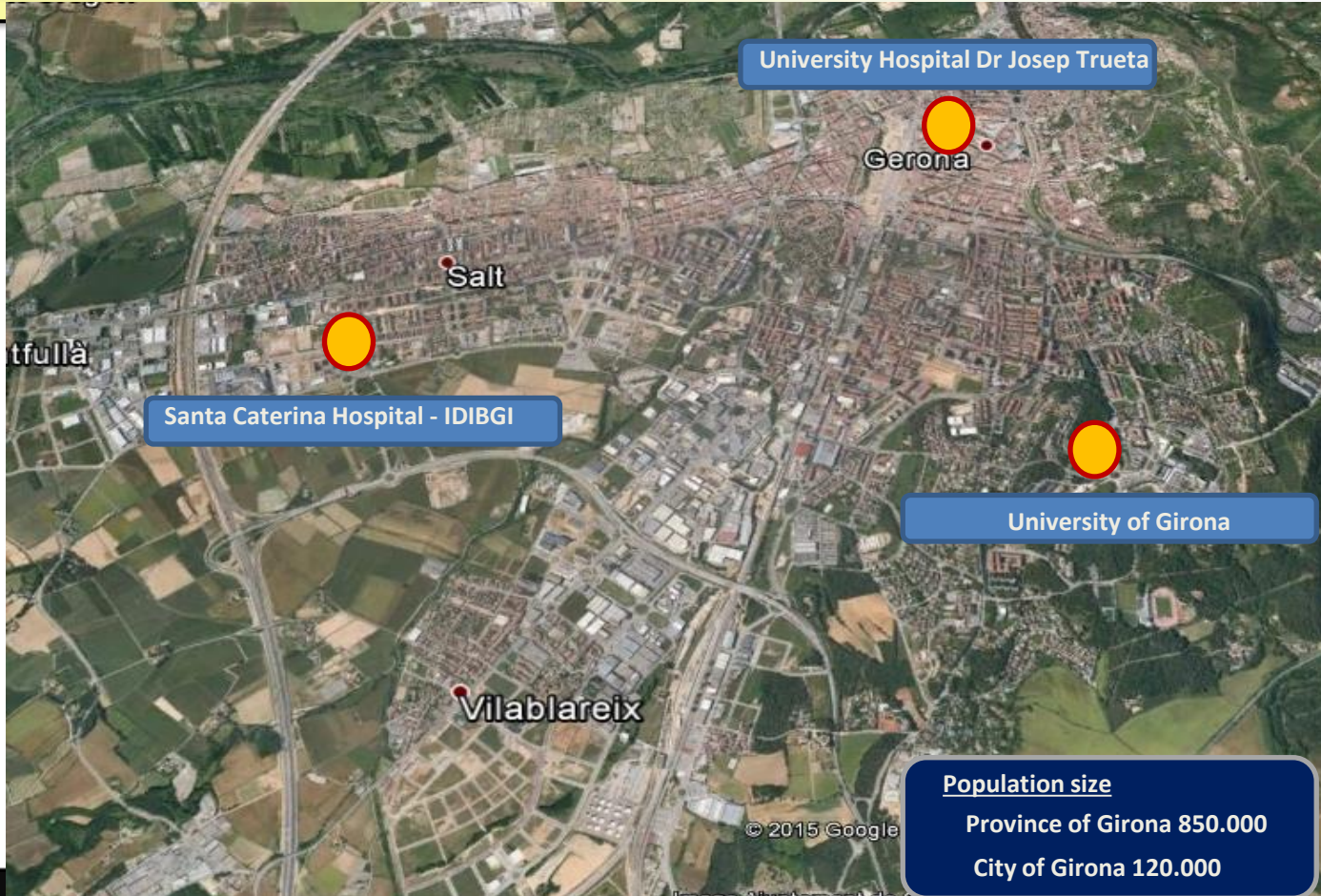
COSMOCAIXA

Aging Imageomics Study

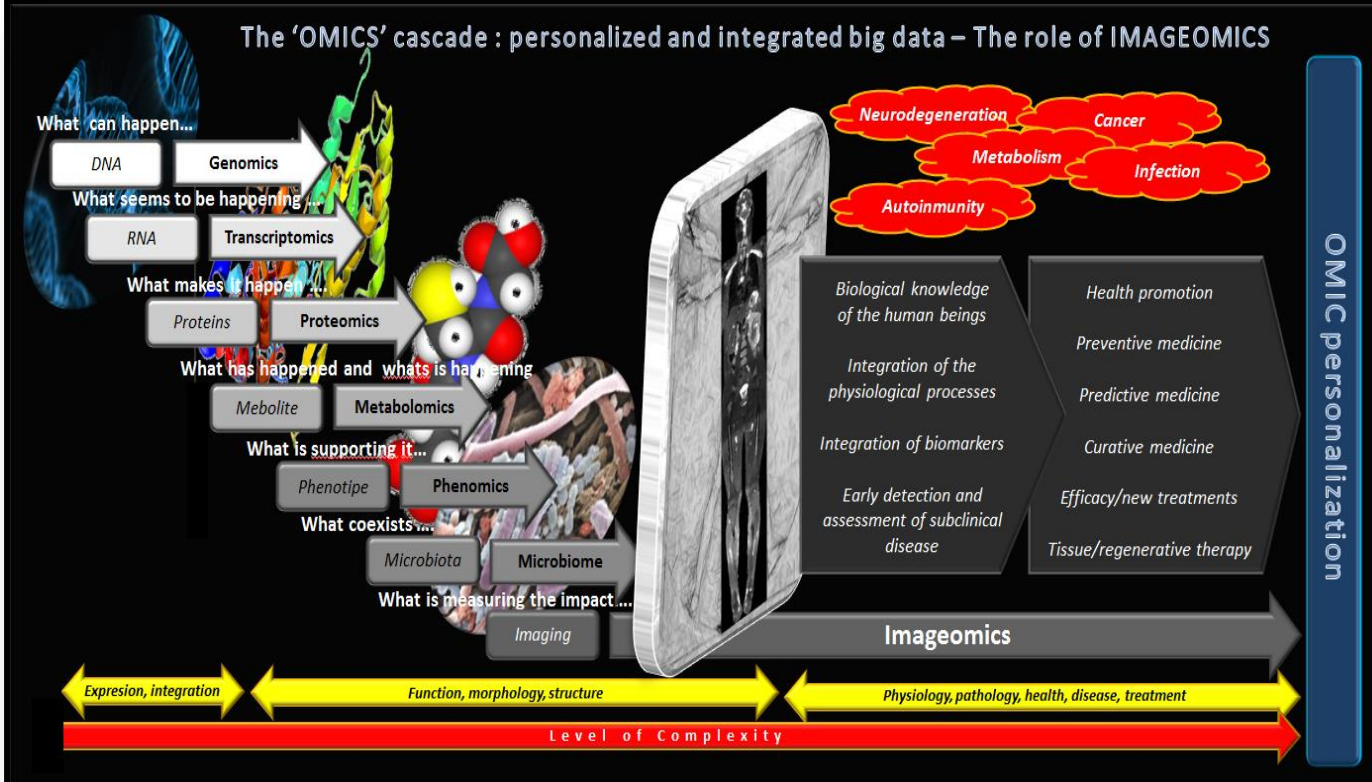
[Looking at imaging, seeing health]



Where we are



'Girona em Ressona' - Aging Imageomics Study



Aging Imageomics Study

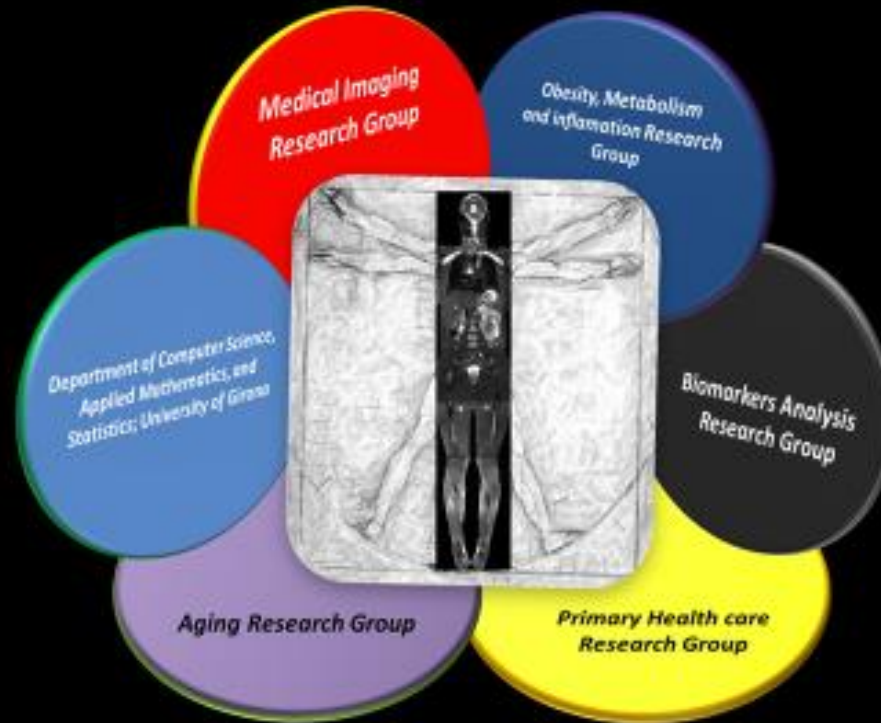


Imaging Protocol





Multidisciplinary team





PRINCIPAL INVESTIGATOR

Josep Puig

PRINCIPAL CO-INVESTIGATORS

Salvador Pedraza

Gerard Blasco

30 investigators

COLLABORATING INVESTIGATORS

José Manuel Fernández-Real

Josep Garre

Rafael Ramos

Pepus Daunis-I-Estadella

Javier Menéndez

Ramon Brugada

Juan Carles Vilanova

Manuel Portero-Otín

Gemma Cuberas Borrós

Wolter de Graaf

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Bruno Triaire

Yasmina Chaibi

Jordi Gich

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Gemma Xifra

Reinald Pamplona

Mariona Jové



Medical Imaging (IDIBGI) – JPuig, SPedraza, GBlasco, JCVilanova

Aging, Disability, and Health (IDIBGI) – JGarre

Endocrinology/DM/Nutrition (IDIBGI)– JMFernández-Real

Metabolic Pathophysiology (IRBLI) – RPamplona

Cardiovascular - IDIAP Jordi Gol (IDIBGI) – Rramos, GColdeTuero

Gencardio (IDIBGI) – RBrugada

Neurology (IDIBGI) – LIRamió, JSerena

Computational Neuroscience-CBC (UPF) – GDeco

Biobanc (IDIBGI)– ARodríguez

IDIBGI – JBarretina

Aging Imageomics Study





'Girona em Ressona' - Aging Imageomics Study

dIB
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The Survey of Health, Ageing and Retirement in Europe

- ✓ Multidisciplinary panel database of micro data on health, socio-economic status and social and family networks
- ✓ 123,000 individuals > 50 years
- ✓ 20 European countries



*An observational population study in adult subjects **50 years** of age or older in the province of Girona to develop advanced **imaging biomarkers** based on **whole-body MRI** associated with aging and its relation with **biopsychosocial, cardiovascular parameters, lifestyle, metabolomics, lipidomics and microbiomics** characteristics.*



P1. To create a **large repository of images** and data from advanced metabolic, structural, and functional MRI of the human body.

P2. To create a **population-based atlas of aging** of the human body from these images and data to help to stratify the population into subgroups.

P3. To determine the extent to which advanced **imaging biomarkers** based on **whole-body MRI** are associated with different **biopsychosocial parameters** related to health, **cardiovascular indexes, metabolomics, lipidomics, microbiomics, frailty** and others changes related to aging.



S1. To evaluate the **prevalence of whole-body MRI biomarkers** of risk and subclinical disease.

S2. To propose **algorithms** to facilitate **decision-making for population-based screening programs** in asymptomatic subjects, based on whole-body MRI parameters for the detection and characterization of biomarkers of health risks.

S3. To investigate the **predictive power** of whole-body MRI biomarkers for the occurrence of **cardiometabolic events** within five years.



Participants



The final sample size has been **1029 participants**

.... on Nov 14 (2017) *first participant was recruited*

5 pts 'early shift'

10 pts/day Mon-Thurs

50-70 pts/week

5 pts 'late shift'

5-10 pts/weekend

200-280 pts/month



Visits
(we see them twice)



Visit 1 (IDIBGI and IAS)

Signing of the informed consent (10')

Carotid Ultrasound (10')

Whole-body MRI (50')

Delivery pots (feces, urine)



Aging Imageomics Study



Aging Imageomics Study - V1 Mobile MRI unit



Aging Imageomics Study - V1 Mobile MRI unit





Visit 2 (EUSES) *10 -15 days after V1*

Delivery feces and urine samples

Blood draw (10')

Antropometric and vascular data (10')

Breakfast (20')

Tests and questionnaires (90')

Imaging report (paper doc and CD) (15')





Imaging Protocol

Aging Imageomics Study



Imaging Protocol



Aging Imageomics Study



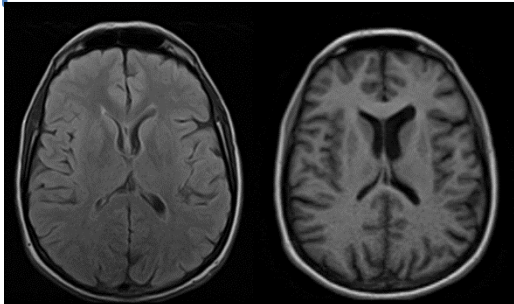
Project	Country	Year (range)	Industry partner	Sample size	Age range	MR Imager (Tesla)	Whole-body MRI	Imaging time (min)	Genomics	Biopsychosocial characteristics	Cut microbiota	Metabolomics and Lipidomics
<i>The Rotterdam Study</i>	Netherlands	Since 1989	-	14926	55-106	1.5	No	30 (brain)	Yes	No	Yes	No
<i>Cardiovascular Health Study</i>	USA	1994-1996	-	303	65-89	1.5	No	45 (brain)	No	No	No	No
<i>Multi-Ethnic Study of Atherosclerosis</i>	USA	2000-2008	General Electric	6500	45-84	1.5	No	30 (carotid, cardiac)	Yes	Yes	No	No
<i>Study of Health in Pomerania (SHIP-TREND)</i>	Germany	2008	Siemens	8016	20-79	1.5	Yes	60	Yes	Yes	No	No
<i>1000BRAINS Study (German Helix Nucleof Recall)</i>	Germany	2011-2021	Siemens	1000	45-75	3	No	75-90	Yes	Yes	No	No
<i>German National Cohort</i>	Germany	2016-2020	Siemens	30000	20-69	3	yes	60	Yes	No	No	No
<i>Aging Imageomics Study</i>	Spain	2017-2018	Toshiba	2000	50-98	1.5	yes	60	No	Yes	Yes	Yes



- Neuro
- Cardiovascular
- Abdomen
- Full Body



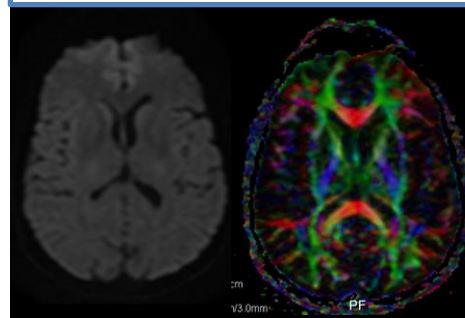
Morphology



T2 FLAIR

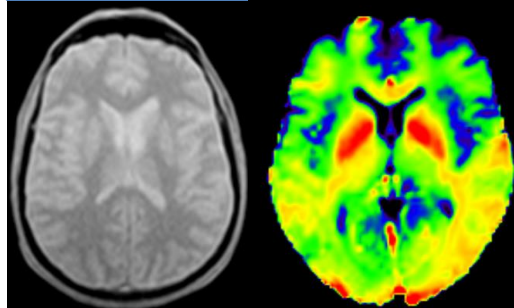
3D T1

Structural



Diffusion Tensor (12dir)

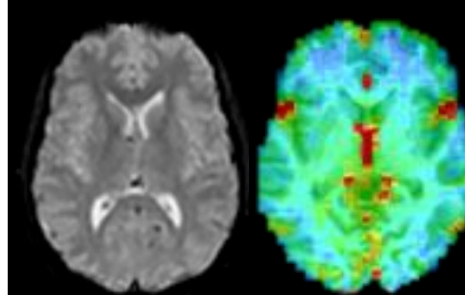
R2* - Iron



T2* mapping

R2* map

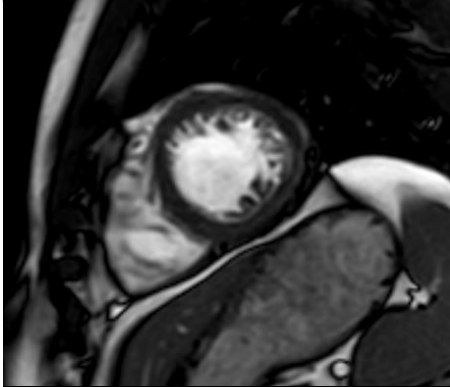
Functional



Rs-fMRI

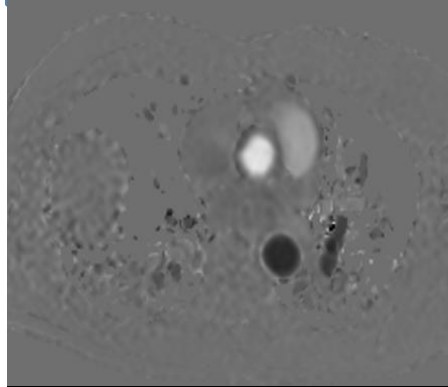


Morphology & Function



m2D SSFP

Aortic Arch Elasticity



2D Phase Contrast

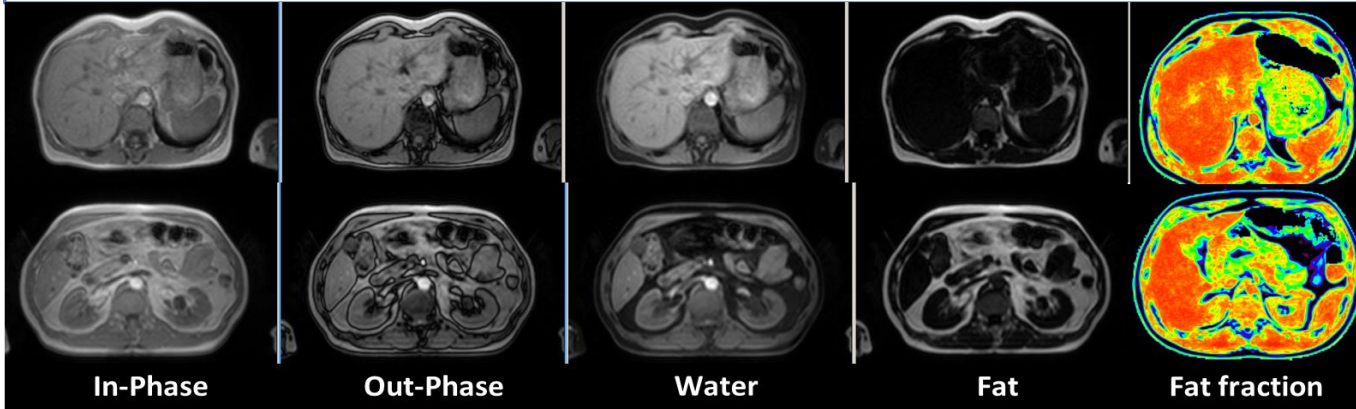
Aortic Bifurcation



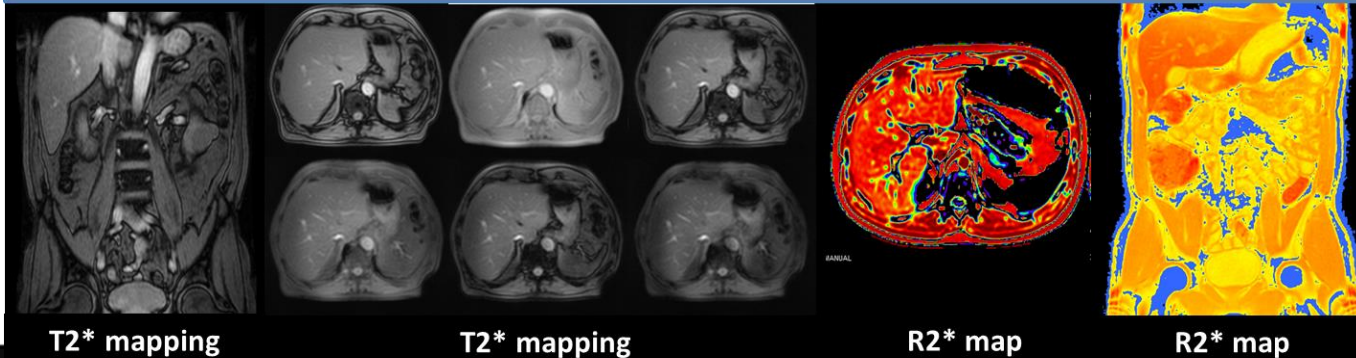
Non-CE ARM



Fat Deposition and Distribution

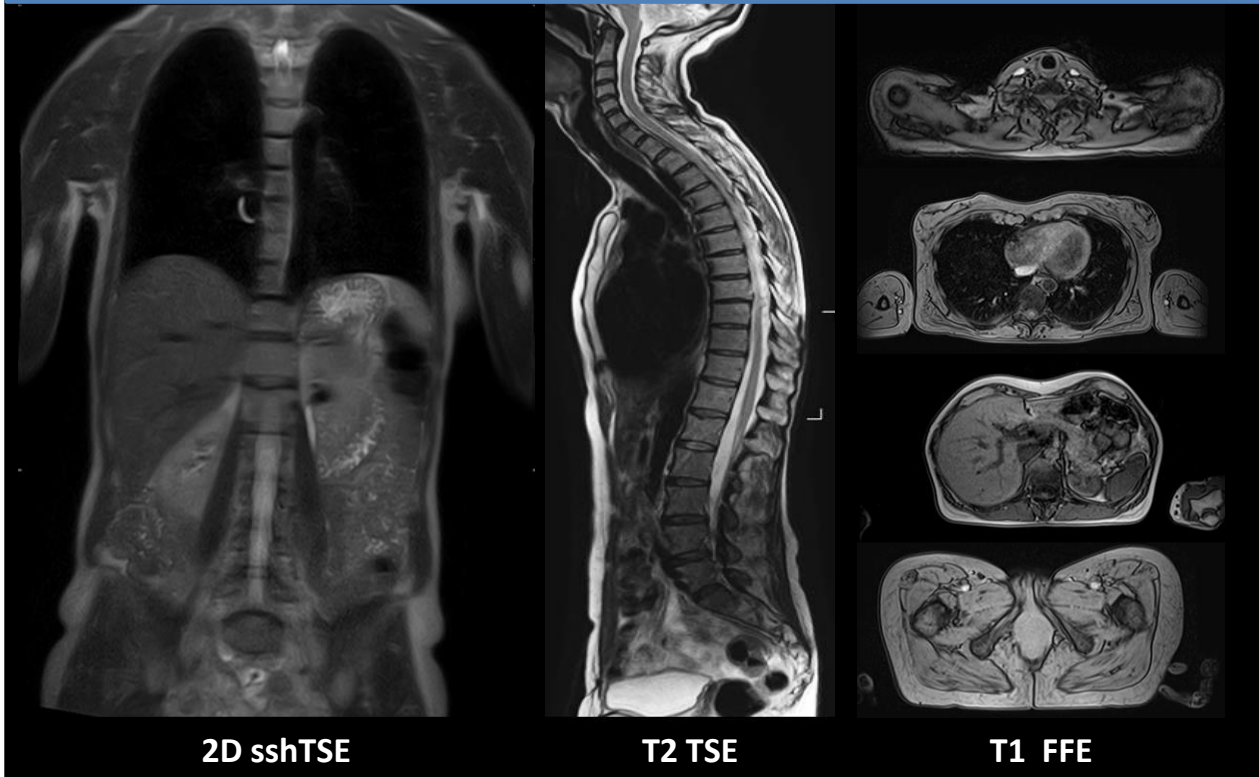


Tissue Iron Concentration





Full Body Morphology



2D sshTSE

T2 TSE

T1 FFE



Incidental Findings



Aging Imageomics Study - Incidentaloma managing

IdIB
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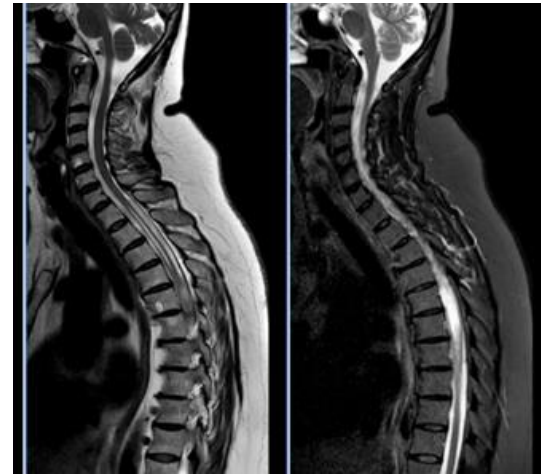
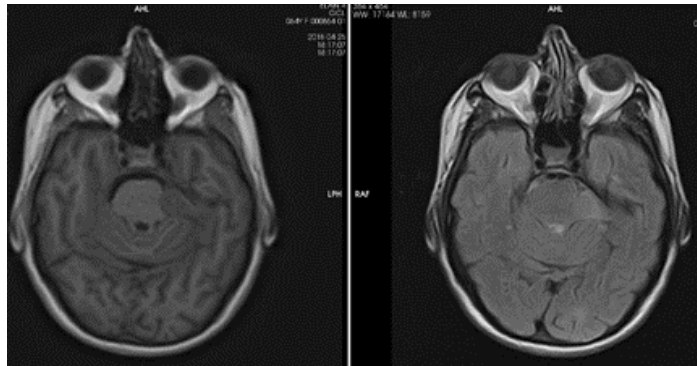
Category	Findings
I	No referral necessary; normal or findings common in asymptomatic subjects (e.g., <i>sinusitis</i>).
II	Routine referral; findings not requiring immediate or urgent medical evaluation, but should be reported to the referring physician (e.g., <i>old infarction</i>)
III	Urgent referral required within weeks of study for any abnormality that will need further yet non-emergency evaluation (e.g., <i>low-grade astrocytoma</i>)
IV	Immediate referral required (e.g., <i>acute subdural hematoma</i>)

* adapted from the Cardiovascular Health Study (Bryan RN, Manolio TA, Schertz LD et al. A method for using MR to evaluate the effects of cardiovascular disease on the brain: the cardiovascular health study. *AJNR Am J Neuroradiol* 1994; 15: 1625-1633)



5 % population: *Early and active management*

Meningioma, High grade glioma , Cortical dysplasia, Cavernoma, Pulmonary tumors, Colon tumor, Bladder tumors, siringomielia, spinal metastasis, etc





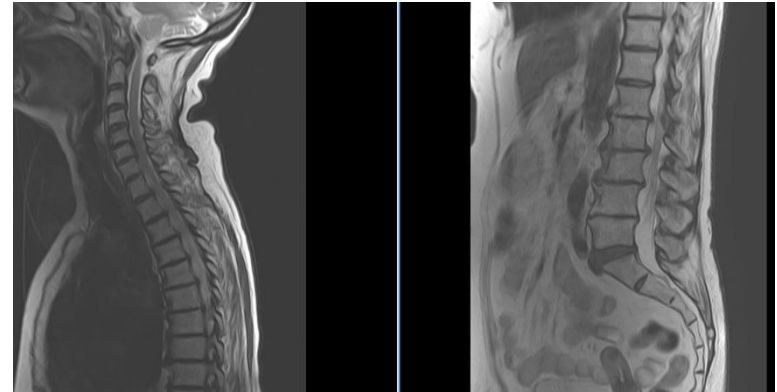
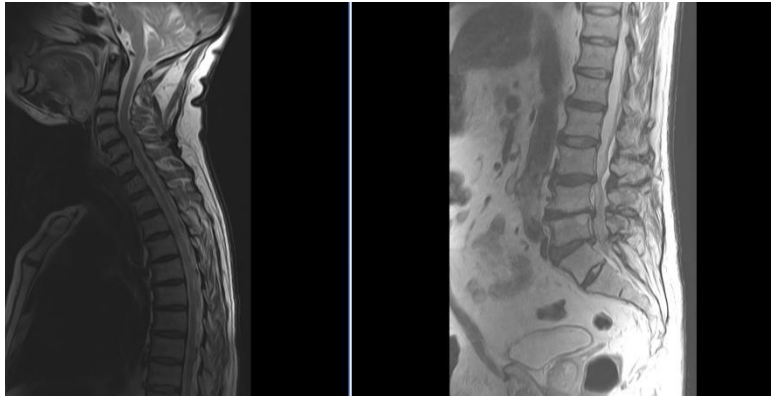
Redefinition of Normality



Change of the concept of Normality.

Very common (80%) in people without back pain the following findings: cervical canal stenosis, lumbar canal stenosis, disk protrusion and disk herniation.

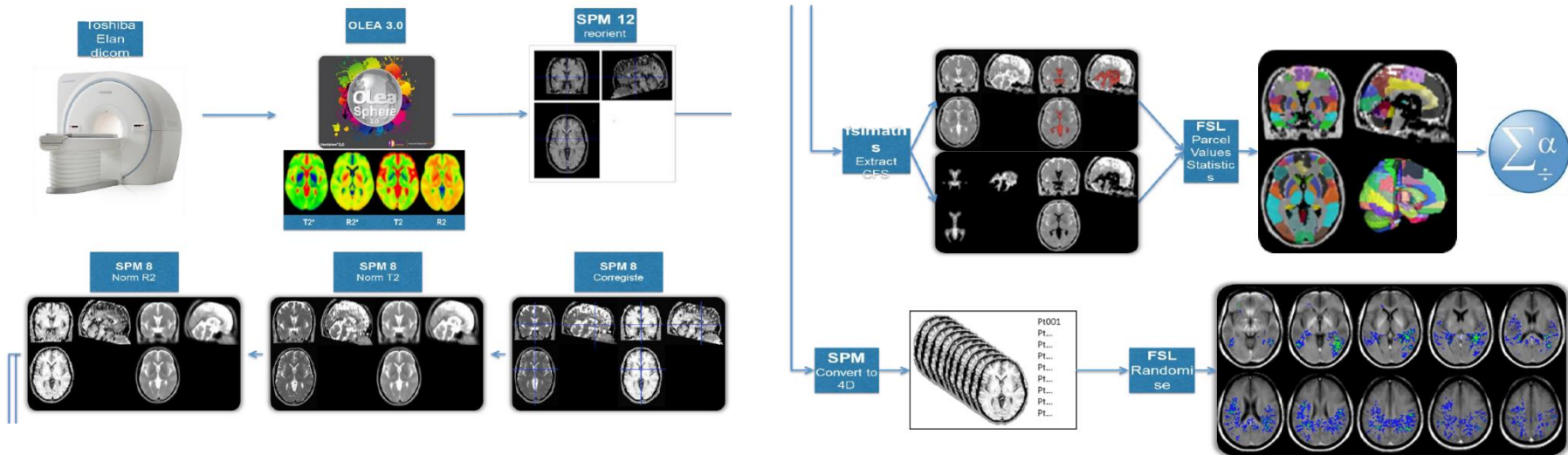
“ Their presence must be interpreted with caution in the context of the clinical situation to avoid overmedication”.





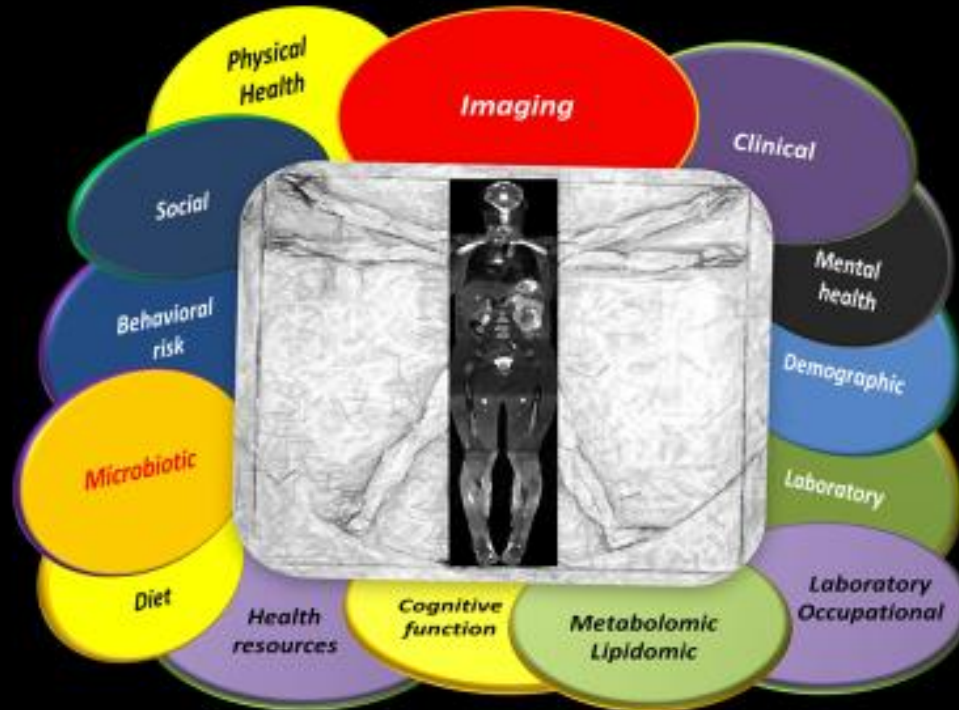
Post-proces. Big Data

Aging Imageomics Study



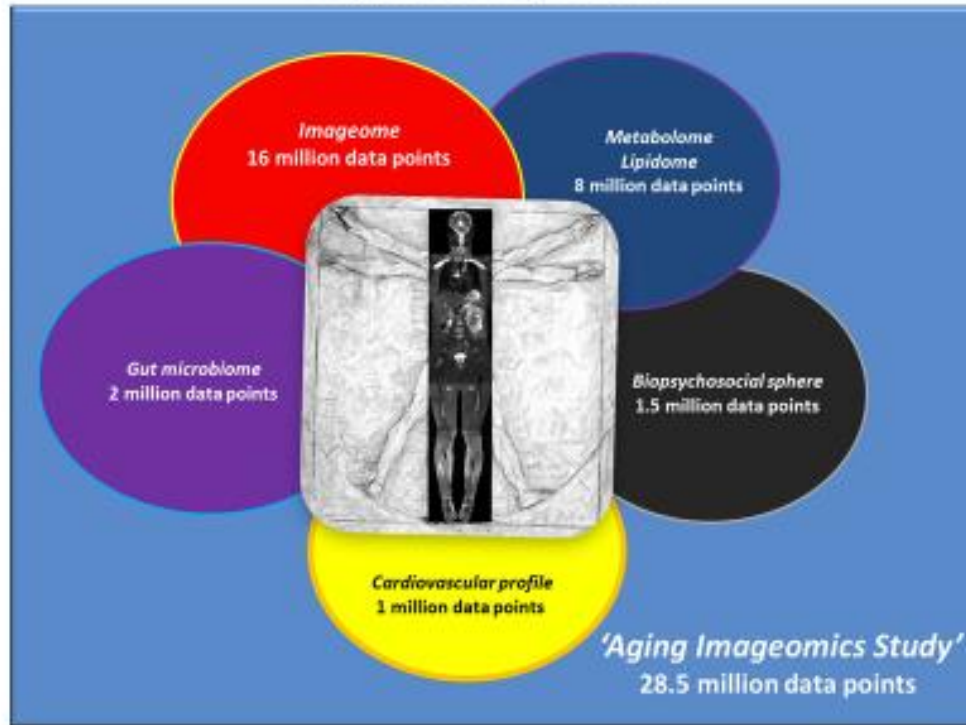


Groups of variables





Big data expected





1. Improving health: Imaging for Life.

This project will allow us to have a large bank of data acquired through advanced imaging of the human body that is representative of the adult population of our community.

The repository of MRI studies will help us to better understand the physiological processes associated with aging in the human body, as well as to model the aging of organs through a metabolic, structural, and functional imaging atlas.

All this information will be useful in developing advanced imaging biomarkers to identify biopsychosocial risks associated with aging and in generating new hypotheses for further study.



3. Personalized risk estimation

Evaluating the risks will include an estimation of the morbidity load derived from the various risk factors, each of which can be modified by many different strategies; this will enable us to obtain an overview of the relative role of the different risks for the health of the population as well as of individuals.

In the future, imaging biomarkers based on whole-body MRI could be validated as tools to assess personalized risk, making it possible to reliably estimate and compare the morbidity load associated with one or more risk factors.

Place imaging upfront in prevention of diseases.



4. Monitoring of primary prevention strategies

The large amount of quantitative data available can make imaging biomarkers based on whole-body MRI useful for monitoring the effects of future primary prevention strategies.

5. Designing powerful algorithms to predict cardiometabolic risk

Finding a lesion in an asymptomatic patient results in more treatment options, better prognosis, and lower treatment costs than finding the same lesion in later stages of disease. The study will enable us to identify whole-body MRI biomarkers that can better predict the appearance of cardiometabolic events within a 5-year period.



6. **Sharing data** with other initiatives.
7. Opening a **new field of research**: increase number of papers and thinking in a collaborative initiatives (international projects).
8. Developing potentially patentable new concept 'Imageomics'.
9. Having a great **impact on population health worldwide**: all governmental authorities accept with enthusiasm the initiative.



Aging Imageomics Study

[Looking at imaging, seeing health]





Generalitat de Catalunya
Departament de Salut



Institut Català
de la Salut



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