CREACTIVE project, WP6

Image analysis

SME partner: Orobix srl

CREACTIVE partner: Orobix Srl

OROBIX

SME (Small Medium Enterprise) founded in 2009 and based in Bergamo, Italy

Focused on data engineering and image analysis

Heavily involved in the design and development the PROSAFE engine

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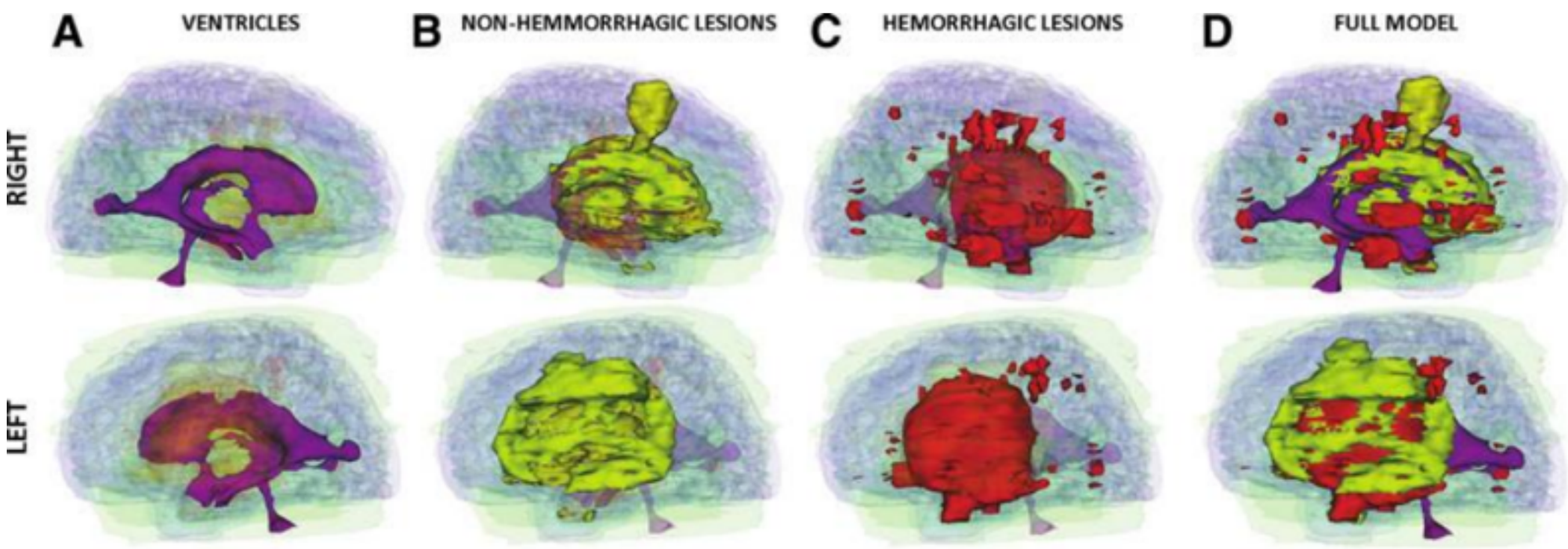
Imaging in TBI

TBI has a macroscopic manifestation over the first hours from injury that can be captured using imaging.

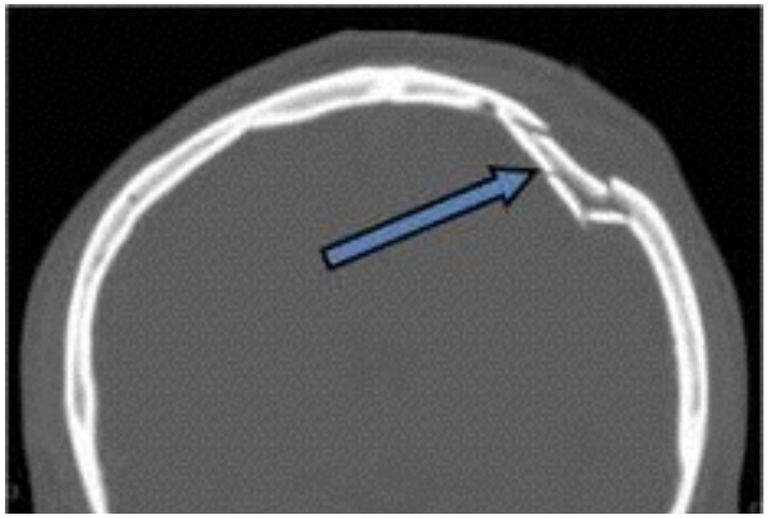
Imaging has a potential value in enhancing the prediction of the outcome of TBI [Warner et al, J Neurotrauma 2010].

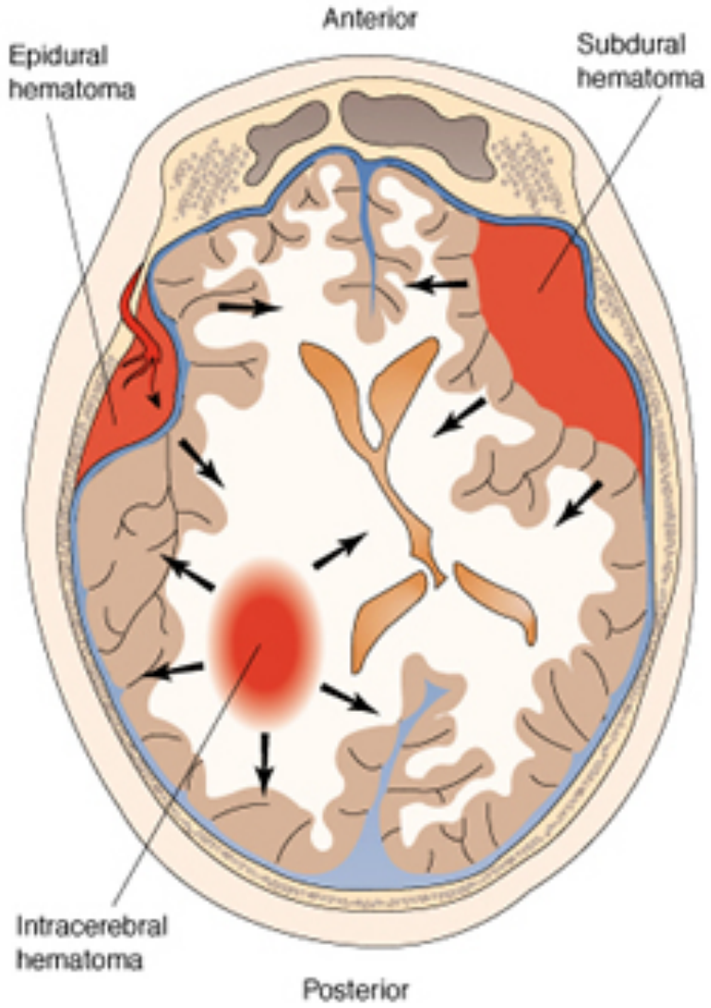
As part of CREACTIVE, we now have the opportunity to verify this potential though an extensive collection of imaging examinations from selected centers and (semi-)automated image quantification.

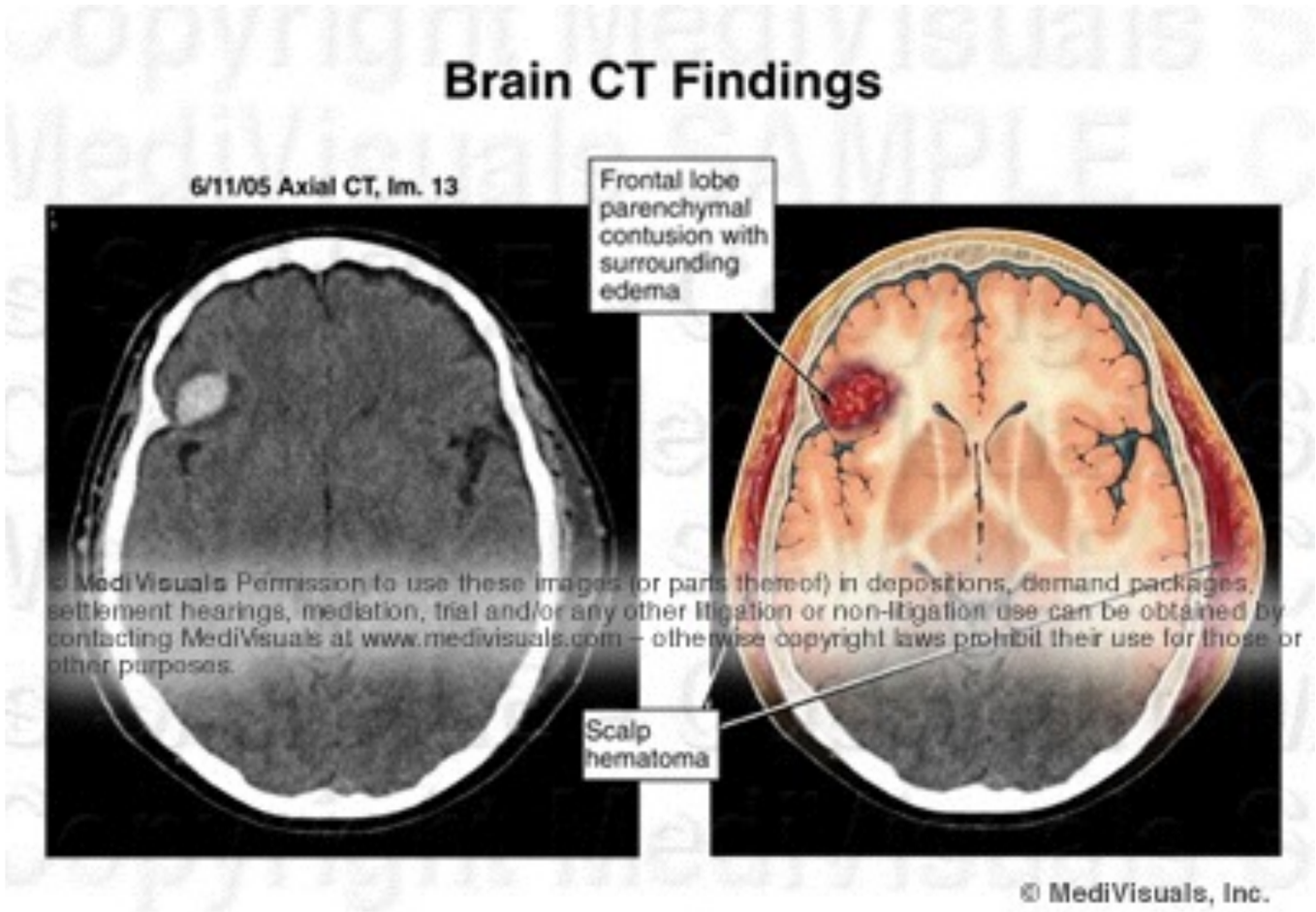


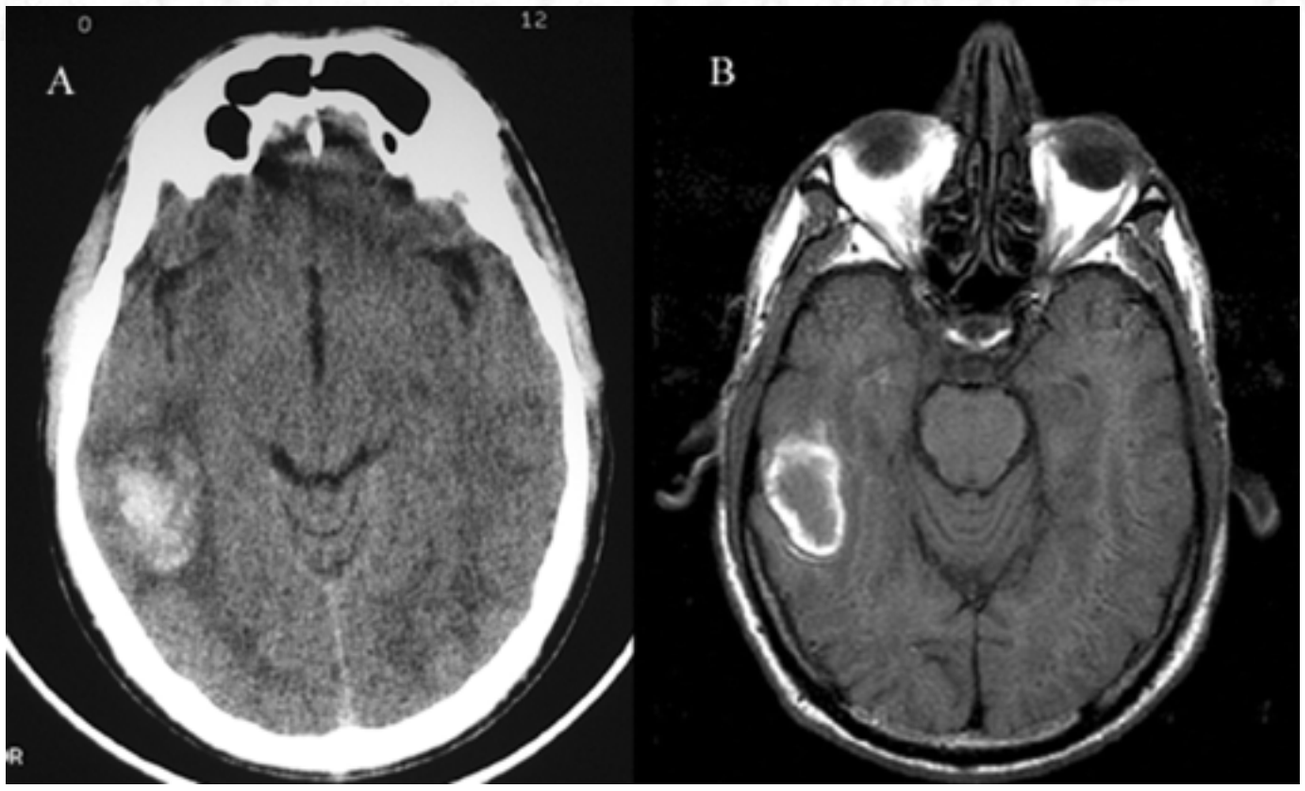
Irimia et al, J Neurotrauma 2011

Imaging in TBI (CT)







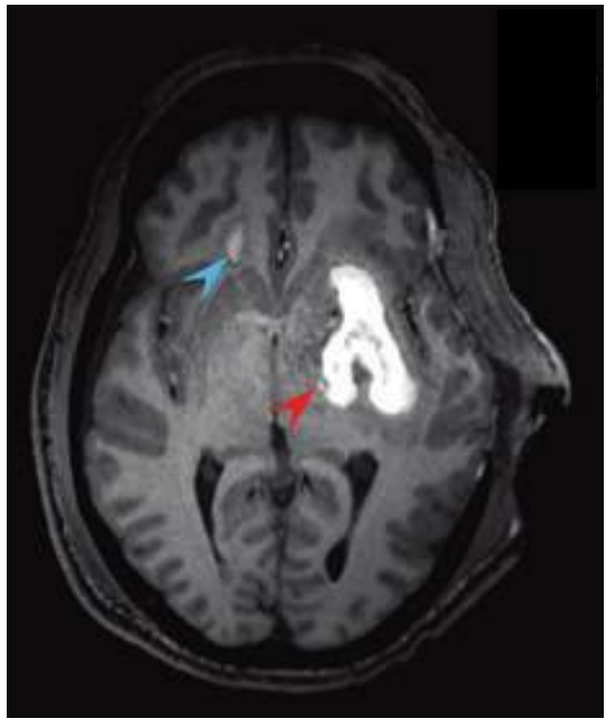


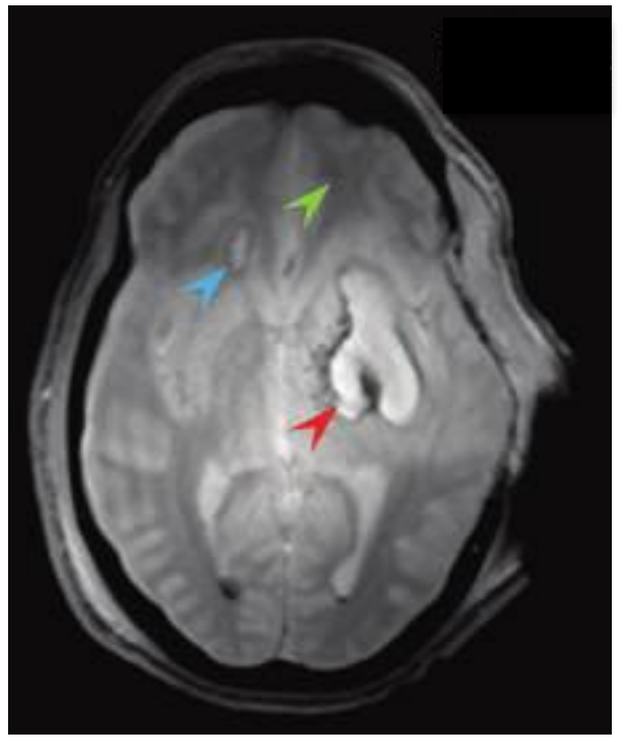
Imaging in TBI (MR)

Focus on core (T1)

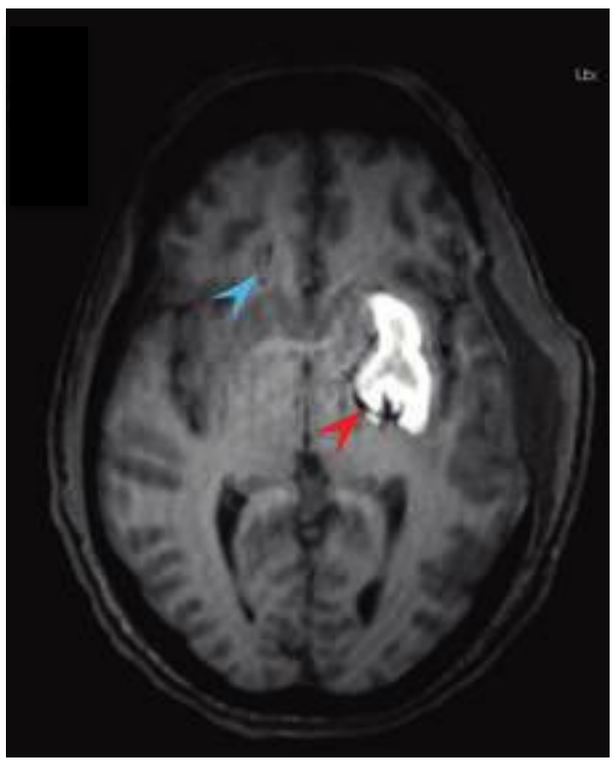
Focus on oedema (T2)

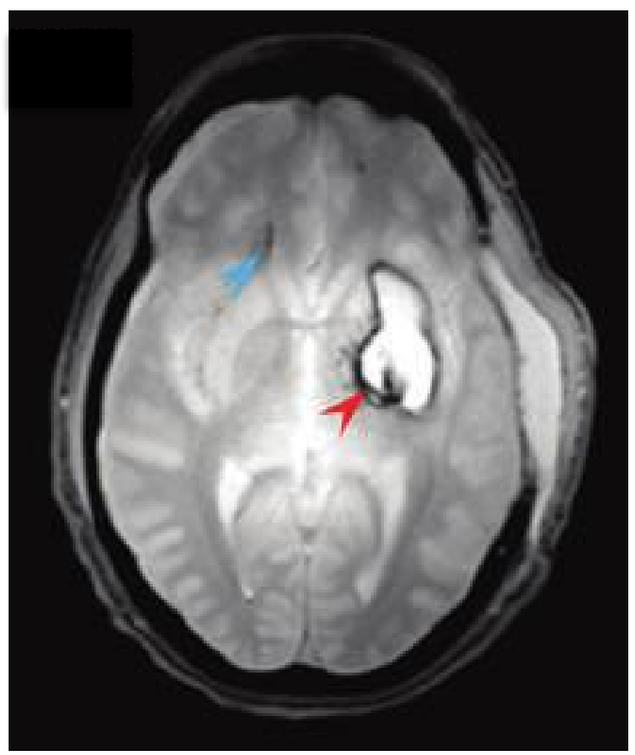
Acute phase



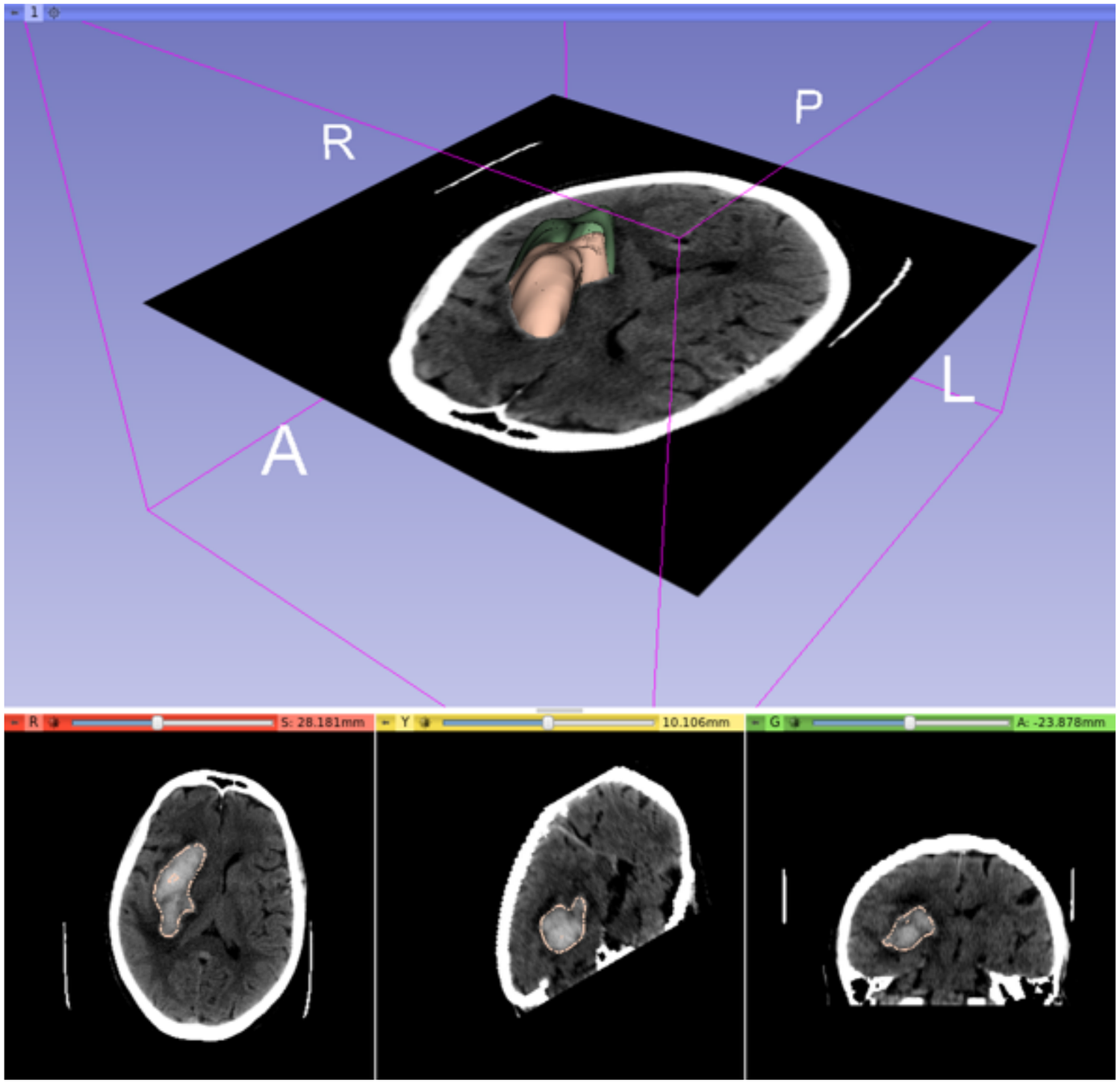


Follow up





Imaging in TBI (MR)

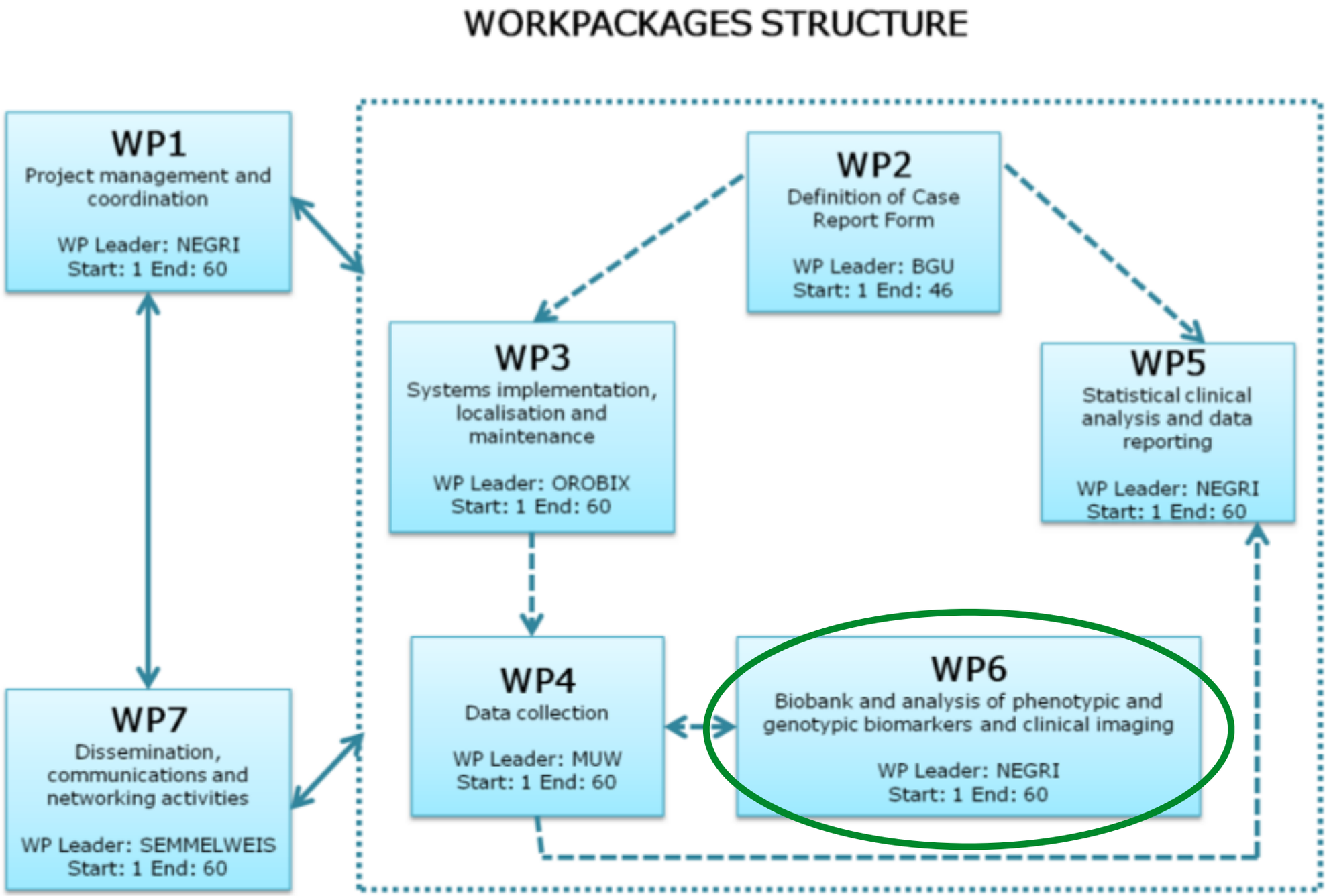


Sample.

Semi-automated segmentation and 3D reconstruction of hemorrhagic core (pink) and edema (green) from CT.

Images provided by Enrico Fainardi.

Role of imaging in CREACTIVE: WP6



Imaging sub-committee

Eleftherios Magkanas (GR) - *Neuroradiologist*

Enrico Fainardi (IT) - *Neuroradiologist*

George Kagadis (GR) - *Engineer*

Ilan Shelef (IL) - *Neuroradiologist*

Luca Antiga (IT) - *Engineer* (coordinator)

If you are part of the committee, please get in touch with me (Lorenzo Botti).

Luca Antiga and I will contact you shortly after the GiViTI meeting for an introductory meeting on Google Hangout.

WP6 Biobank and biomarkers

Goal: improve prediction of TBI outcome, stratification

- Identify the “extremes” in the distribution of focal lesion volume progression
- Assess associations with the outcome

- Analysis of phenotypic and genotypic biomarkers
- Assess associations with the outcome

WP6 Biobank and biomarkers

Task	Timeline
6.2 Establish CREACTIVE clinical image bank	January 2014
6.3 Develop automatic image processing software	March 2014
6.4 Perform image analysis	end of 2014 - end of project

6.2 CREACTIVE clinical image bank

- 2000 of the 7-9000 TBI patients are expected to be enrolled (20%).
- The subgroup of ICUs that will participate to image bank establishment are supposed to upload all imaging data of trauma patients acquired during the stay (i.e. at all timepoints).
- No imaging protocol will be enforced, but we will provide optional guidelines for CT and MR. We expect the majority of images to be acquired by CT.
- Imaging data will be collected centrally on a GiViTI server using a dedicated interface within the PROSAFE software.
- Eligibility to collect medical images should be discussed with GiViTI, each ICU must obtain ethical approval.

6.2 CREACTIVE clinical image bank

Image upload process (1)

- Access the trauma petal CRF in PROSAFE, click on an “Upload images” button
- Select location of images from
    1. some folder on PC or local network
    2. CDs or DVDs
    3. USB keys
- Software automatically identifies series in DICOM files and shows images in a viewer
- select location of lesions by clicking on images

6.2 CREACTIVE clinical image bank

Image upload process (2)

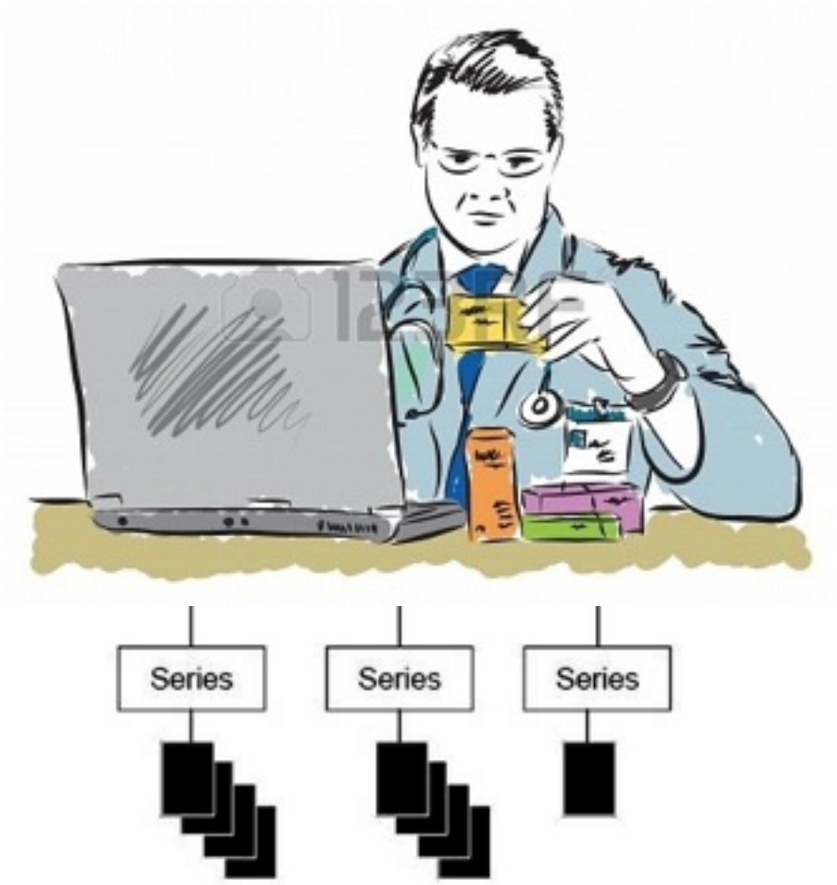
Before the upload (no privacy concerns)

1. system anonymises DICOM headers
2. system automatically erases patient face from images

Upload

1. images are stored locally in PROSAFE master
2. the master takes care of synchronisation with the media database repository hosted on the GiViTI data warehouse

Imaging data collection



upload by the user

synchronisation

media database

PROSAFE

GiViTI

6.3 Automatic image processing software

1. **Haemorrhagic core**
    i. Rough location is provided by the user during the image upload phase
    ii. Segmentation based on image intensity, image homogeneity and asymmetry
    iii. Expert verification (on a subset of the images)

2. **Peri-haemorrhagic edema**
    i. Identified automatically as the region of low intensity surrounding the core
    ii. The shape of the core will be used as a constraint to verify the correctness of edema segmentation

3. **Shape, size and rate of change over time**
    i. Recorded and compared to stratify the patients and explore clinical usefulness (task performed in collaboration with GiViTI and other partners involved in WP5)

Timing and questions

	TASKS	duration	months 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
WP6	**Biobank and biomarkers**																															
6.1	Scientific advisory board meetings																															
6.2	Establish CREACTIVE clinical image bank																															
6.3	Develop automatic image processing software																															

- The new trauma CRF will be available by the end of the year so that you can start uploading

- If you have questions please contact me lorenzo.botti@orobix.com