

Heterogeneity follow-up of 4 glioma models growth using multiparametric MRI data and clustering analysis.

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Laboratories : GIN, Inserm & UGA

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Outline

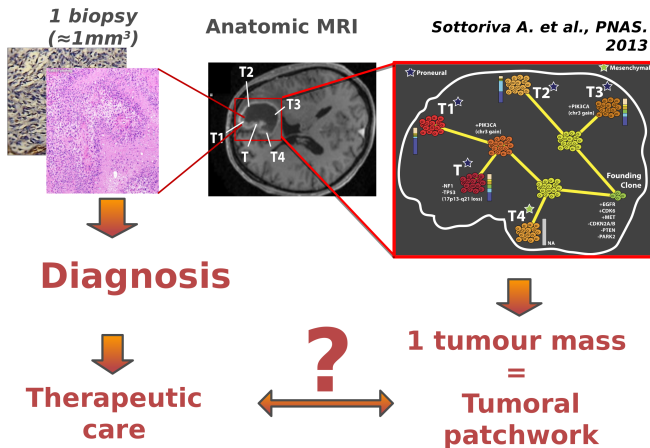
- 1 Brain tumor characterization: biopsy vs MRI analysis
- 2 MRI data analysis: voxel clustering
- 3 Conclusion & Future work

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How to characterize brain tumor ?

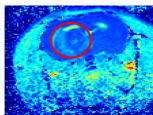
Biopsy



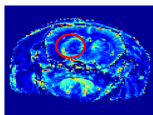
How to characterize brain tumor ?

Multiparametric MRI

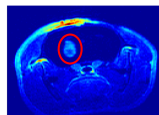
Different available contrasts:



ADC



BVF

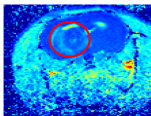


DCE

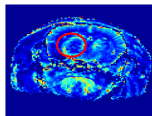
How to characterize brain tumor ?

Multiparametric MRI

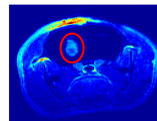
Different available contrasts:



ADC

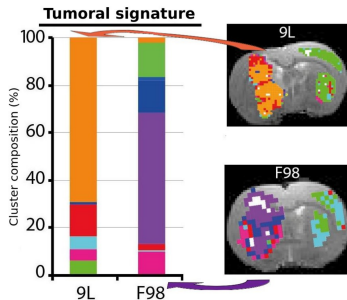


BVF



DCE

1-time clustering
(Coquery et al. 2014)



Goals

- clustering of the voxels from multi time-point acquisitions
- sensibility of the clustering for close tumor models

Outline

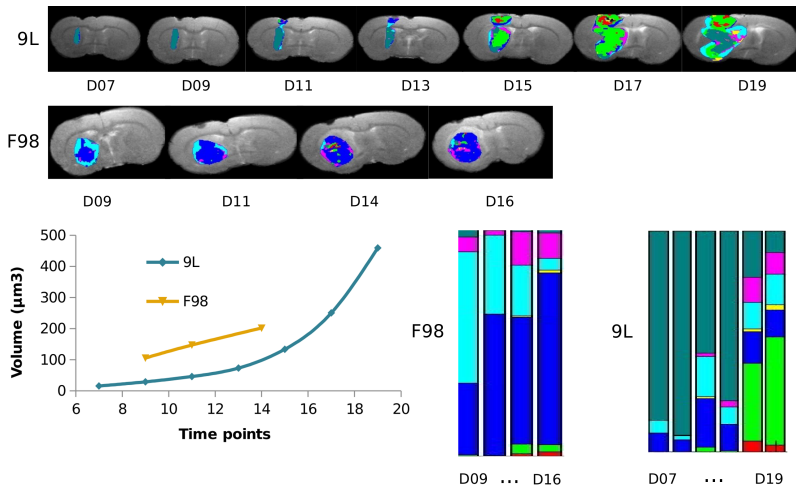
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Multiparametric MRI data

- Animal models: **9L**, **F98** (Fisher rats), and **U87 Mir-C**, **U87 Mir-X** (Nude rats)
- Protocol Acquisition
 - **Anatomical scan 1 day before a 24 days follow-up**
 - Animal number selected per group: **n = 8**
 - Time acquisition: 1h/rat
 - Voxel size: 234x234x800 μm
- Quantitative MRI maps: **T1**, **T2**, **ADC**, **BVF**, **DCE**
- Histology
 - Thickness section: 20 μm
 - Staining: H&E
 - Immunohistochemistry: REC-A (vessel size), Ki-67 (proliferation)
 - Image digitization (slide scanner)

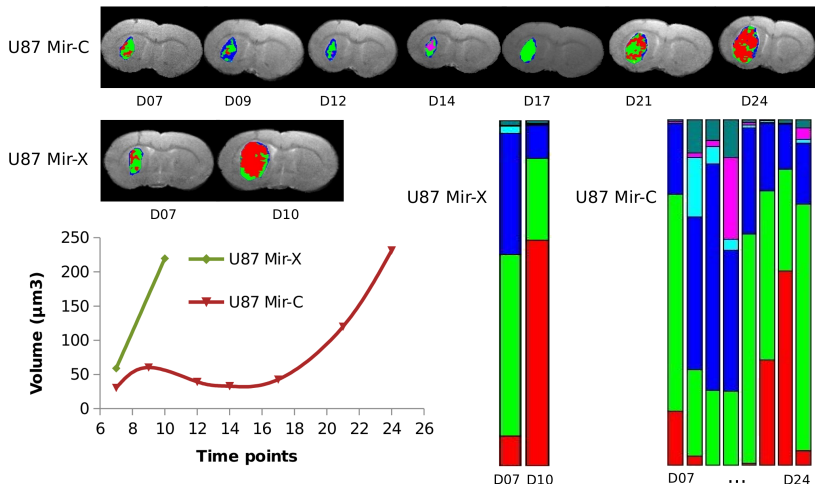
Tumor growth

9L and F98



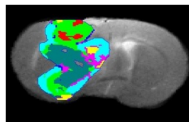
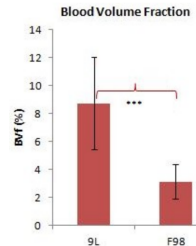
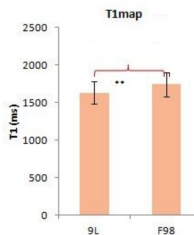
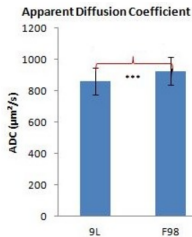
Tumor growth

U87 Mir-C and U87 Mir-X

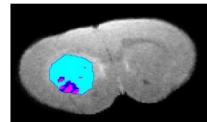


Tumor model comparison

9L vs. F98



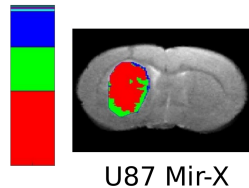
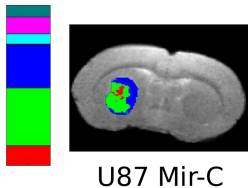
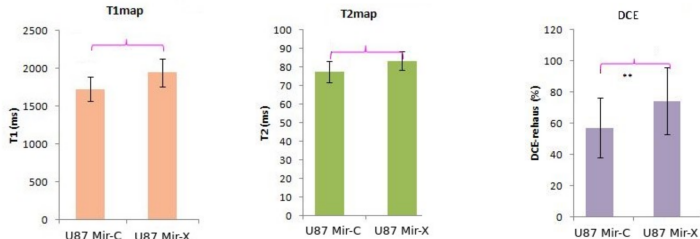
9L



F98

Tumor model comparison

U87 Mir-C vs. U87 Mir-X



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Summary

■ Conclusions

- Cluster analysis seems to be a suitable technique to quantify and follow intra-tumor heterogeneity
- Cluster analysis is sensitive enough to assess inter-tumor heterogeneity

■ Perspectives

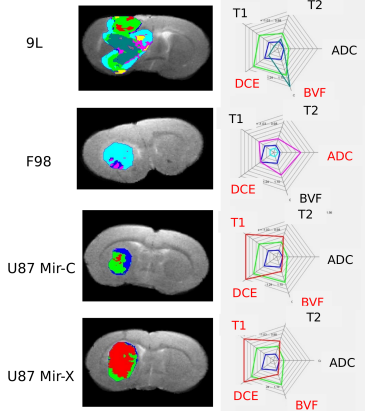
- Automatic delineation of the tumors.
- Taking into account spatial dependences.
- Significance test of the signatures across time.
- Link between histology and clustering.

The end

Thank you !

Tumor clustering interpretation

Clustering composition : on equal humour size



Dominant Clusters per model of glioma

- Green
- Blue
- Green pine

- Cyan
- Purple
- Blue

- Bleu
- Green
- Red

- Red
- Green
- Blue