

# QuPath-based approach to evaluate liver parenchyma status: preliminary data

Artyom Borbat<sup>1</sup>, Alexandr Dushkin<sup>2</sup>, Ilya Serdyuk<sup>3</sup>

1. Leycor LLC (Moscow, Russia) 2. Sechenov University(Moscow, Russia) 3. FSBEI FPE RMACPE MOH (Moscow, Russia).  
email: aborbat@yandex.ru

## Introduction

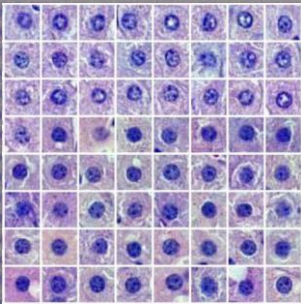
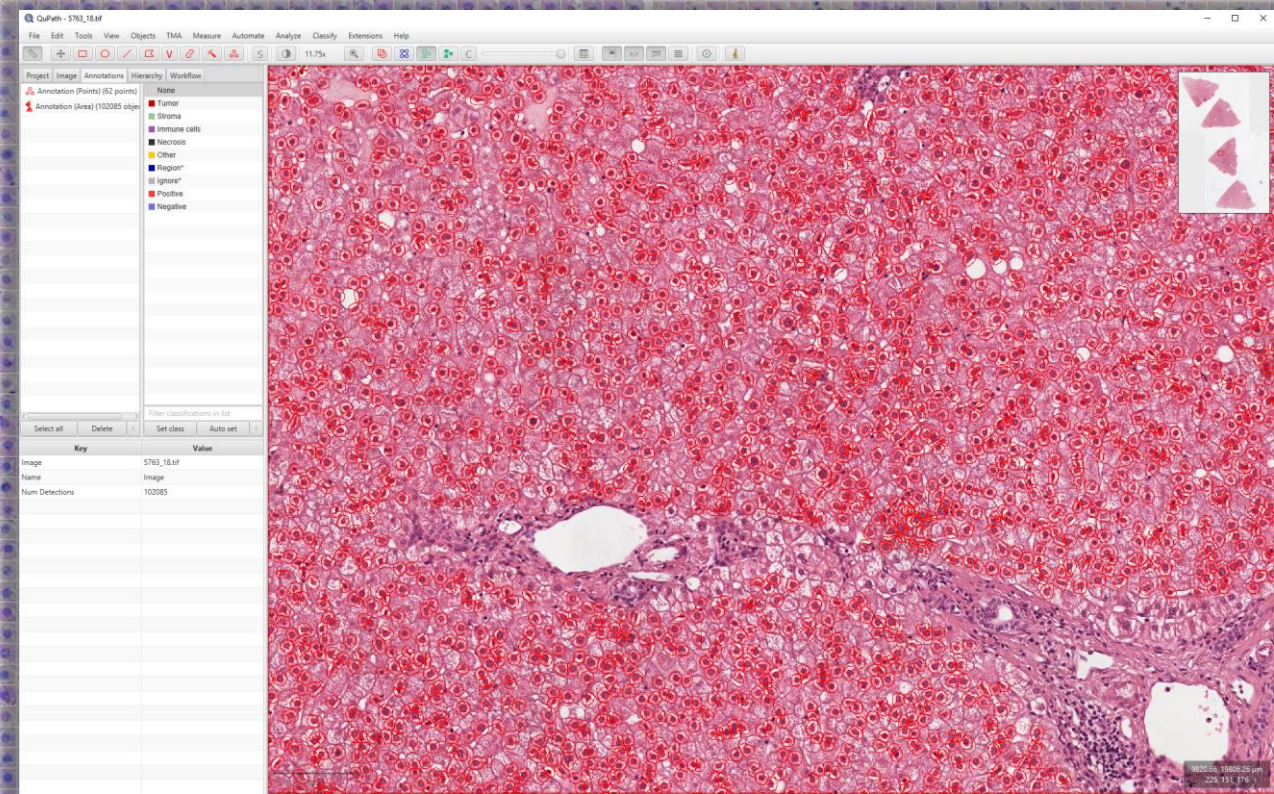
Liver parenchyma condition is important for evaluation dead donor organ status. Current approach is based on visual evaluation and semi-quantitative estimation of hepatocyte with fat degeneration. The approach is a semi-quantitative and subjective. The aim of the study was to develop an approach using QuPath software and whole-slide images to objectively evaluate dead donor parenchyma changes comparing to normal liver.

## Material and methods

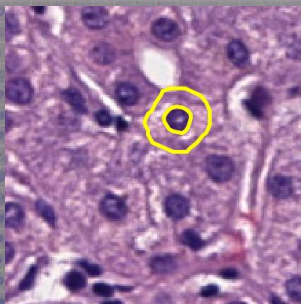
- 30 needle biopsy samples from alive donors (AD)
  - 15 surgical biopsy samples from dead donor (DD)
- H&E slides scanned x20, 96 dpi
  - QuPath analysis of the WSI
  - cell detection algorithm with liver parenchyma and no portal tracts
  - ANOVA analysis

## Results

- cells per sq mm: DD 23% less than AD.
- cells per sq mm with nucleus circularity >0.9: DD 50% less than AD.
- mean nucleus circularity for all evaluated cells was 5% lower at DD group.

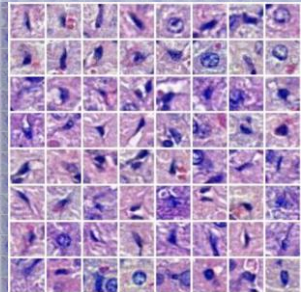


cells with nucleus circularity >0.9 = normal hepatocytes



Nucleus: Area	35.2447
Nucleus: Perimeter	21.394
Nucleus: Circularity	0.9677

cells with nucleus circularity <0.5 = mesenchymal cells



Nucleus: Area	28.5417
Nucleus: Perimeter	27.8269
Nucleus: Circularity	0.4632

## Conclusions

We propose an approach, which allows objective evaluation of liver parenchyma status and identify features, distinguishing dead donor liver changes. The study is ongoing with the focus on finding objective criteria to evaluate liver parenchyma status for diagnostic purposes.

		Cells per sq mm (x10 <sup>4</sup> )			Mean nucleus	
		all	>0.9	<0.76	circularity	area
Val N	DD	15	15	15	15	15
	AD	30	30	30	30	30
Mean	DD	21	4	1	0.78	35.1
	AD	27	8	2	0.81	33.8
Std Dev	DD	5	2	1	0.04	3.3
	AD	7	3	1	0.03	3.2
t-value		-3.0	-4.5	-0.9	-2.7	1.3
p <		0.01	0.01	0.5	0.05	0.2
F-ratio		1.65	1.95	1.5	1.3	1.1

The research is granted by  
**Foundation for Assistance to Small Innovative Enterprises (FASIE)**  
119034, 1/5, 3<sup>rd</sup> Obydenskiy per, Moscow, Russia