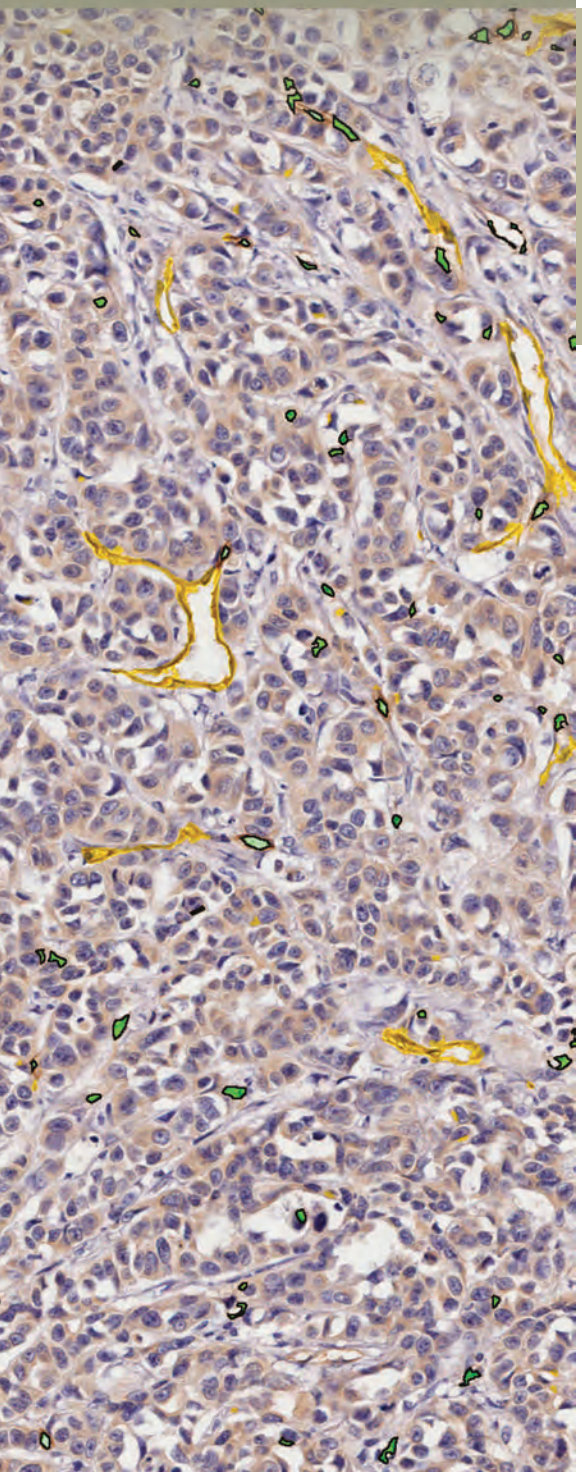
Microvessel Analysis

Analyzing capillary and microvessel infrastructure is critical in many disease areas. From matrigel assays in cardiovascular research to vascular morphology changes in xenografts to microcapillary measurements in ophthalmology, researchers need to understand and quantify vascular architecture. With whole slide scanning and the Microvessel Analysis Algorithm, a tedious and subjective manual counting task can be automated and standardized.

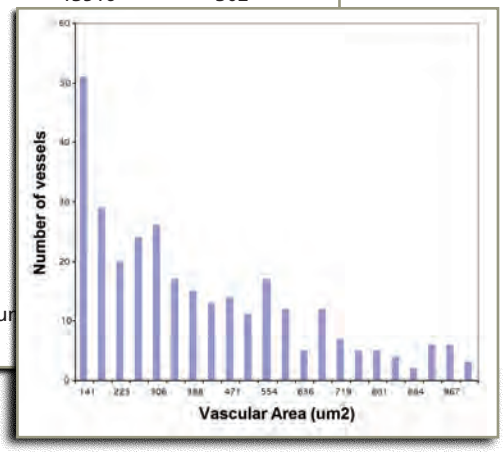
Detect new angiogenic vessels from larger vasculature, even in overstained xenografts.



Automate and standardize vascular architecture measurements with microvessel analysis across whole slides.

Microvessel analysis typically starts with a Factor VIII or CD31 stained slide, scanned at 20x or 40x. A novel dual-level thresholding algorithm screens out non-specific staining. Regions are then assembled into vessels, and individual statistics are calculated on each vessel. The user can choose which statistic to graph, and then can generate a summary report.

Statistic	Tumor	Normal
Number of Vessels	704	352
Total Analysis Area (μm²)	12811307	4110861
Total Stain Area (μm²)	9535109	62105
Average Stain Intensity	158667	191
Mean Vessel Area (μm²)	143066	213
Median Vessel Area (μm²)	996743	121
Standard Deviation of Vessel Area	13516	302
Mean Vessel Perimeter (μm)		
Median Vessel Perimeter (μm)		
Standard Deviation of Vessel Perimeter (μm)		
Mean Lumen Area (μm²)		
Median Lumen Area (μm²)		
Standard Deviation of Lumen Area (μm²)		
Mean Vascular Area (μm²)		
Median Vascular Area (μm²)		
Standard Deviation of Vascular Area (μm²)		
Mean Vessel Wall Thickness (μm)		
Median Vessel Wall Thickness (μm)		
Standard Deviation of Vessel Wall Thickness (μ		



Microvessel Analysis Algorithm
Microvessel Analysis is a smart object recognition algorithm that can filter out existing larger vessels, and identify and compute morphology statistics on only the newer angiogenic vessels.

Specifications

Input Parameters

Overlap Size
Image Zoom
Markup Image Type
Include/Exclude Vessels Without Lumen
Filtering/Smoothing Level
Dark Staining Threshold
Light Staining Threshold
Region Joining Parameter (µm)
Vessel Completion Parameter (µm)
Minimum Vessel Area Threshold (µm²)
Maximum Vessel Area Threshold (µm²)
Maximum Vessel Wall Thickness (µm)
Output Histogram Statistic
Histogram Start Value (µm or µm²)
Histogram End Value (µm or µm²)
Number of Bins
Endothelial Stain (RGB)
Background Stain (RGB)
2nd Background Stain (RGB)

Summary Output Statistics

Number of Vessels
Total Analysis Area (µm²)
Total Stain Area (µm²)
Average Stain Intensity
Microvessel Density (vessels/µm²)
Mean, Median, SD Vessel Area (µm²)
Mean, Median, SD Vessel Perimeter (µm)
Mean, Median, SD Vascular Area (µm²)
Mean, Median, SD Vessel Wall Thickness (µm)
Average Optical Density (RGB)

Individual Vessel Statistics

Vessel Area (µm²)
Vessel Perimeter (µm)
Lumen Area (µm²)
Vascular Area (µm²)
Vessel Wall Thickness (µm)

Mark-up Types

0 – Tuning – Vessel or Endothelial Stain
1 – Tuning – Vessel Thresholding
2 – Analysis – Vessels
3 – Analysis – Lumen and Vascular Cells
4 – Analysis – Vessels (Show Excluded Vessels)

Headquarters
Aperio
1360 Park Center Drive
Vista, CA 92081

Main: 866.478.4111
Fax: 760.539.1116

info@aperio.com
support@aperio.com
www.aperio.com

European Operation
Aperio
3 The Sanctuary
Eden Office Park
Ham Green
Bristol BS20 0DD, UK

Main: 011 44 1275 375 123
Fax: 011 44 1275 373 501

europeinfo@aperio.com
europesupport@aperio.com
www.aperio.com

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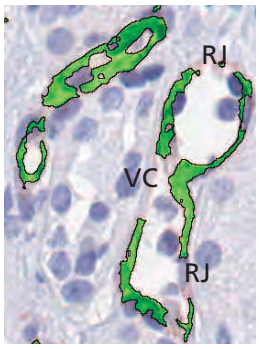
Mark-up Types

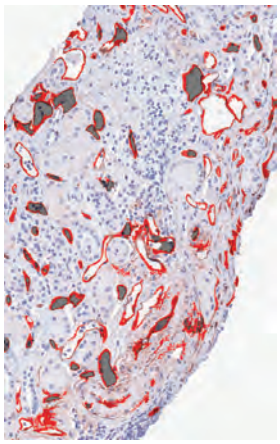
Endothelial cells

Endothelial cells grouped to make regions

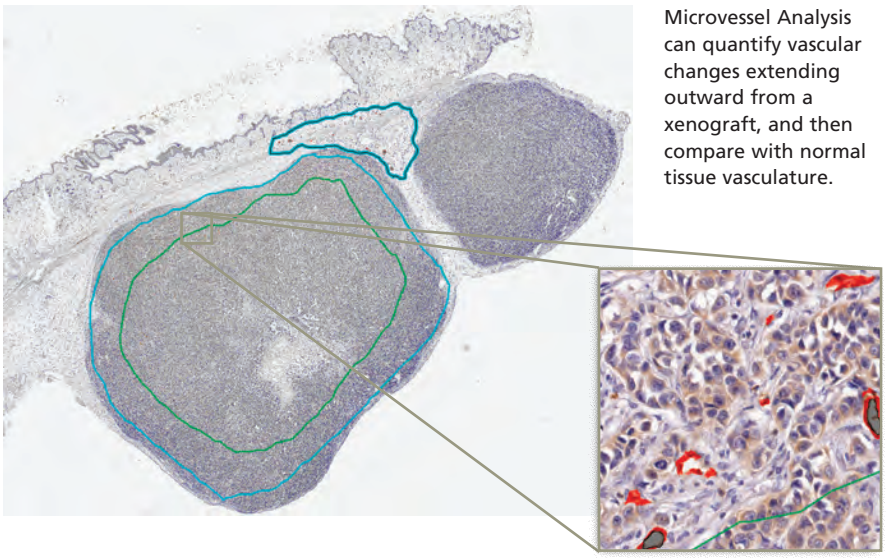
Vessel perimeter drawn in middle of vessel walls



The algorithm allows the user to specify the distance at which two regions should be joined (RJ), and the distance for which a vessel should be completed (VC).



Calculate vessel wall thickness changes across whole slide images.



Microvessel Analysis can quantify vascular changes extending outward from a xenograft, and then compare with normal tissue vasculature.

For more information about our solutions for digital pathology, please visit www.aperio.com or call us at 866-478-4111.

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