

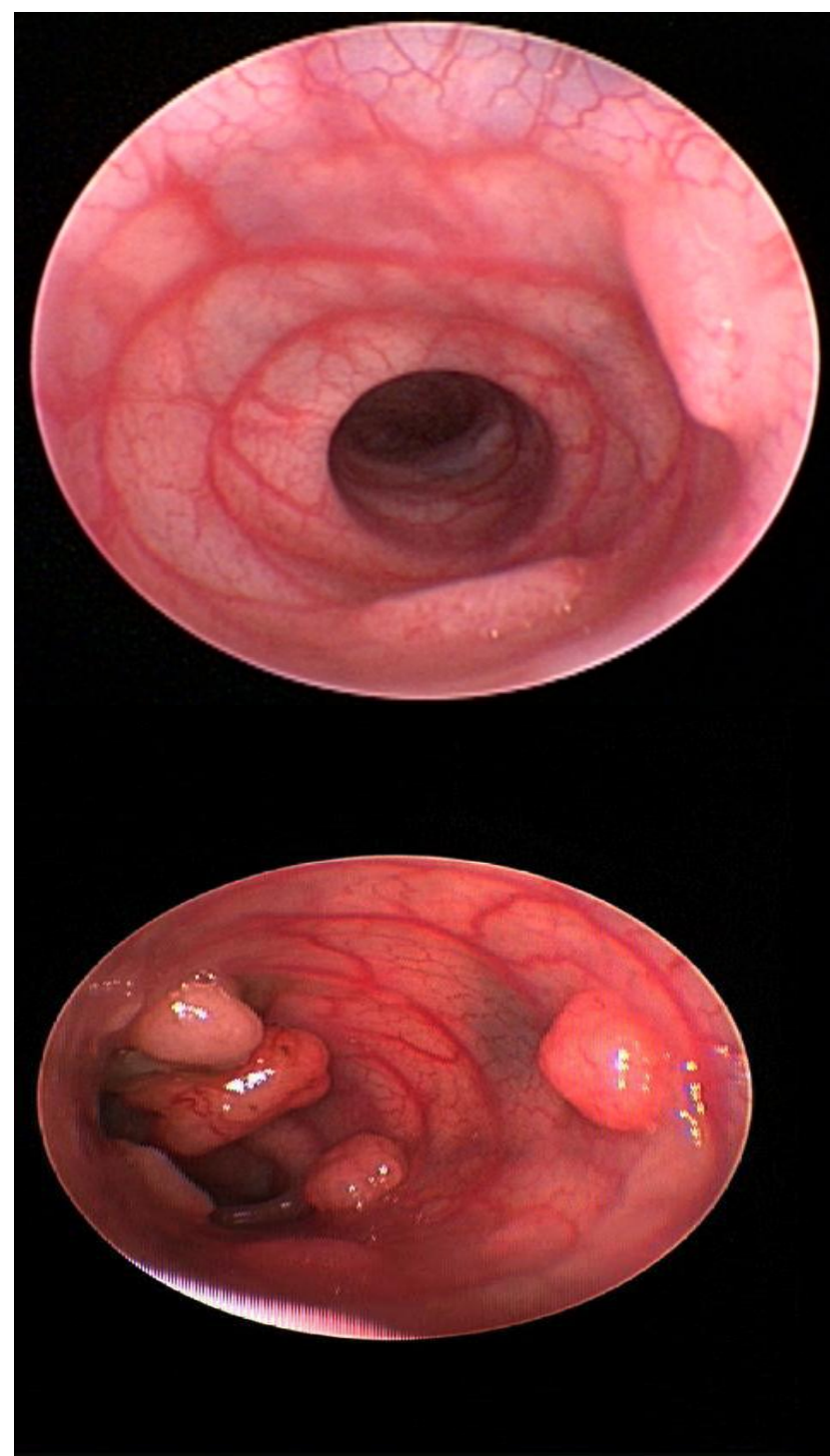
Biocast Tumor Measurement

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Abstract

Colorectal cancer is the third most common type of cancer. Our clients at the McArdle Laboratory for Cancer Research are using an animal model to research colorectal cancer. By monitoring tumor growth over time, they hope to better understand tumor growth and recession. This will allow the clients to assess various treatment options for humans with colorectal cancer. However in order to do so, they need reliable volume measurements and are unable to with their current methods. We have devised a process to create a cast of the entire colon of a rat or mouse using alginate impression powder. The tumor impressions in this cast can be filled using dental stone to get a mold of individual tumors. These molds can be weighed to give relative changes in volume over time.

Client Requirements



- Method must quantitatively measure the volume of tumors *in vivo*
- Must be capable of monitoring growth over time: Ideally absolute, relative change acceptable
 - Tumor response to drugs
- Measurements must not contain more than 10% to 15% error.
- Technique must not harm the animal or interfere with tumor
- Budget of \$1000

Current Devices

- Endoscopes are used to visually assess the size of tumors throughout development
 - The Storz 7219BA endoscope is used for rat test subjects
 - The Storz 1232AA endoscope is used for mouse test subjects.
- Endoscopes use a fish-eye lens, which distorts the proportions of an image
 - Fish-eye distortion makes it impossible to quantitatively determine tumor size
- Computed Tomography (CT) imaging can also be used to determine tumor size
 - This method costs \$100 per scan which is undesirable
 - This requires test animals to be removed from their clean environment
 - Once removed from their clean environment, test animals cannot be returned to this environment

Final Design/Procedure

Creating a Colon Biocast

- Initial colon navigation and injection tube placement
- Mixing dental alginate and water and loading into 60cc syringe
- Dental alginate injection and solidification
- Removal



Volume Measurement

- Filling Biocast tumor impressions with dental stone
- Removal and weight measurement of stone tumors



Testing



- Calculated density of dental stone: 2188.88 g/L
- Determination of mass difference between dental stone molds: 0.78% error
- Comparison of dental stone mold volume to tumor volume: 10% error

Future Work

- The experimental protocol must be augmented and approved to allow this procedure to be performed on live animals
- Testing on live animals must be performed to determine the success of this method in quantitatively determining tumor growth over time
- Our extensive research into this project has not found any other papers describing a method similar to this, so this method could be published and the process patented

Cost Analysis

Item	Item Cost	Per Procedure Cost
Alginate Impression Powder (1 lb)	\$20.30	\$0.73
Dental Stone (40 lbs)	\$39.00	\$0.04
Foley Catheter	\$176	0
60 cc Syringe	\$0.65	\$0.07
Silicone Tubing	\$1.37	0
Luer Adapter	\$1.16	0
Total	\$238.48	\$0.84

References/Acknowledgements

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