TIME SAVINGS FOR LIVER VOLUME GENERATION: COMPARISON OF MANUAL AND DEFORMABLE SEGMENTATION METHODS

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Purpose & Objectives

Manually tracing anatomical structures on CT scans is an arduous and time-consuming task for physicians. However, with the growing importance of CT volumetry in radiology this laborious task must be done. One particular area where time saving methods are needed is liver segmentation[1]. Calculation of liver volumes is important for planning of Y90 microsphere treatments for liver cancer[2] and also for liver transplantation. Our goal is to evaluate if MIM Software's deformable segmentation method, Contour CoPilot, can provide comparable accuracy but require less time than traditional manual volume of interest (VOI) generation.

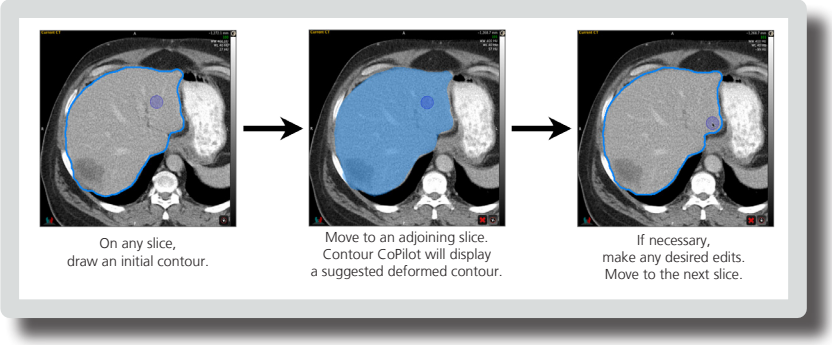
Methods & Materials

CT scans were evaluated retrospectively from 21 patients. The liver spanned 28-43 slices on each study. Manual tracing and CoPilot were used separately on each scan to create liver VOIs. The manual approach utilized a 2D brush to create/edit the VOIs. CoPilot, deformably propagated a VOI from one slice to the next with the observer making slight adjustments as needed. The resultant liver volumes and the average time to create these VOIs were compared from each method.

Results

The average time to generate the final liver VOI for the Manual method was 27.7 min/case (range 19.9 to 37.5 min) whereas CoPilot averaged 11.1 min/case (range 7.7 to 13.1 min), representing an average time savings of 61% ($p = 2.3E-14$). The VOIs generated by the two methods revealed negligible differences with a correlation coefficient of 0.99 and an average volume difference of 4.77ml +/- 7.6ml or 0.2% +/- 0.4%.

Figure 1
Contour CoPilot



Contour CoPilot uses deformable registration to propagate a contour drawn on one image slice to a nearby image slice. By mapping each pixel in one slice to positions in the nearby slice, a mapping is defined to reshape the contour to match the differences in the nearby image slice.

Table 1
Manual vs CoPilot

	Average Time (min/case)	Range	Average Volume ± SD	Average Volume Difference	Correlation
Manual	27.7	19.9 - 37.5	1751 ± 451	4.77 ml ± 7.6 ml	.99
CoPilot	11.1	7.7 - 13.1	1756 ± 455	NA	NA

Conclusion

CoPilot provided significant time savings for creating liver VOIs with an average time savings of 61% while yielding similar volumes when compared to the manual approach. CoPilot has shown the potential to be a valuable tool for volumetry in radiology that can save time while maintaining accuracy when calculating liver volumes.

References

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2. Salem R, Hunter RD. Yttrium-90 Microspheres for the Treatment of Hepatocellular Carcinoma: A Review. IJROBP 2006; 66(2):S83-S88.

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