

Automatic Segmentation of Uterine Niches in Transvaginal Ultrasound: A Feasibility Study

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Objectives

Accurate identification of uterine niches on transvaginal ultrasound (TVUS) is essential for timely treatment and optimizing fertility outcomes. Artificial intelligence (AI) can automate ultrasound interpretation, reduce inter-observer variability, and expand access. This study aims to **develop and evaluate deep learning for reliable, automatic niche segmentation on TVUS, improving consistency in clinical care and research.**

Methods

- TVUS data of uteri with and without uterine niches were collected.
- Manual segmentations were performed by three observers, with expert review when needed.
- We compared three deep learning architectures for automated segmentation:
 - Flexible U-Net (ImageNet pre-trained)
 - Flexible U-Net (trained from scratch)
 - Attention U-Net

Results

Dataset: **601 sagittal TVUS videos**

- 336 with a uterine niche (977 labelled frames)
- 265 controls

Normalized surface distance (NSD): 0.36-0.65
Dice coefficient: 0.53-0.71

Best results were obtained with **Flexible U-net** using a pre-trained encoder and extra augmentations to increase training-data variability (e.g., image flipping, adding random noise, and zooming)

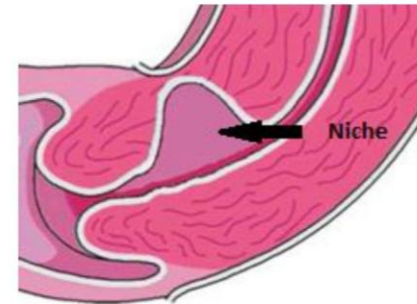


Figure 1: Uterine niche, a cesarean scar defect



Figure 2: Results of automatic segmentation using pre-trained Flexible U-net

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More info:



Conclusion

- **Automatic segmentation of uterine niches on TVUS using deep learning is feasible.**
- Performance strongly depends on choosing the right model configuration. In our study, a pre-trained Flexible U-Net with augmentation yielded the best results.