

Hackathon Research for Team 18

Mai Ohana | 12.01.23

Challenge Name

Plastic Surgery Track

General Description of the Idea

The team came to the conclusion that most devices in this field use 3D simulations, however, 3D models don't take into account skin elasticity.

Research Inquiries

1. What uses are made today with the help of an elastography device? On what organs and for what uses?
2. Implication of the elasticity of the tissue on the chances of recovery and preservation of the results of the surgery while focusing on the breast tissue if possible. Additional plastic surgeries can also be considered.
3. Are elastography tests used (both during surgery and in preparation for it) in surgeries today? If not, are there studies that prove or point to the problematic use of this device in surgery?

Findings

According to Medint research, there are many uses for elastography [1]:

- Chronic liver disease (CLD) - accurate staging of liver fibrosis/cirrhosis
- Quantification of Portal Hypertension
- Characterization of Focal Liver Lesions
- Breast cancer / Imaging in Breast Lesions
- Imaging of thyroid nodules
- Renal Fibrosis / Chronic kidney disease (CKD) / Characterization of Focal Renal Lesions
- Prostate cancer
- Differentiating abnormal lymph nodes
- Imaging of cornea or the sclera of the eye [2]
- Abdominal Aortic Aneurysms [3]
- Inflammatory Bowel Disease (IBD) [4]
- Post-stroke muscle stiffness [5]

1. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5399595/>

2. <https://ieeexplore.ieee.org/abstract/document/9924584>

3. <https://pubs.rsna.org/doi/abs/10.1148/radiol.212323>

4. <https://onlinelibrary.wiley.com/doi/full/10.1002/jmri.27833>

5. <https://insightsimaging.springeropen.com/articles/10.1186/s13244-022-0119>

[1-x](#)

2. One article from 2016 was assessing elastic properties of skin and scars with high-frequency ultrasound elastography [6]. Conclusion of this study was that all the results demonstrated that the proposed HFUS elastography has a great potential for improving the accuracy of elasticity estimations in clinical dermatological diagnosis.

Another article tested shear wave elastography in the evaluation of facial skin stiffness after focused ultrasound treatment, found that baseline stiffness of all examined layers correlated inversely with patients' age. Sixty days after the aesthetic treatment, the stiffness of all tissues improved significantly. Using this

method, the authors documented improved stiffness of facial skin as early as 60 days after the procedure. The beneficial effect of the aesthetic treatment was observed regardless of patients' age but was less evident in women with excess body weight.[7]

6. <https://ieeexplore.ieee.org/abstract/document/9720970>
7. https://journals.lww.com/dermatologicsurgery/Abstract/2019/12000/Shear_Wave_Elastography_in_the_Evaluation_of.25.aspx