



JOHNS HOPKINS

WHITING SCHOOL  
of ENGINEERING

# 4D Conserva®: Breast Cancer Tissue Repair

585.729 Cell and Tissue Engineering

Arvin Xia

# 4Degra®

## Biodegradable

Biodegrades into benign products

## Compressible

Does not lose mechanical properties

## 3D-Printable

Scaffolds can be any shape and size





<https://vimeo.com/574600109>

# 4D Conserva®

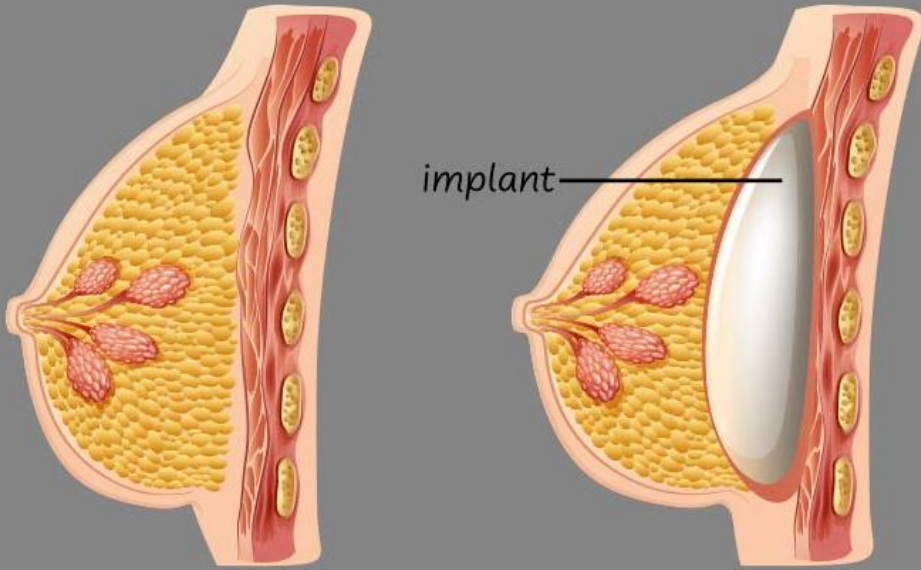
4D Conserva® is a device used for breast reconstruction that is 3D printed with 4Degra®

# Breast Cancer



<https://unitedcsf.org/breastcancerfact/>

- Deemed most prevalent cancer in the world in 2020 by WHO
- 7.8 million women living with a diagnosis
- Mastectomy (breast removal) surgeries are the most common form of treatment
- Mastectomy patients report decreased physical, mental, and psychosocial wellbeing



# Breast Reconstruction

## Existing solutions

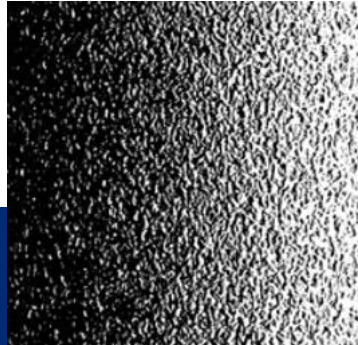
- Most solutions are different types of breast implants
- Typically requires 2 additional surgeries
- Needs to be replaced every 10 years
- Not fully biocompatible
- Very costly

# 4D Conserva® Benefits



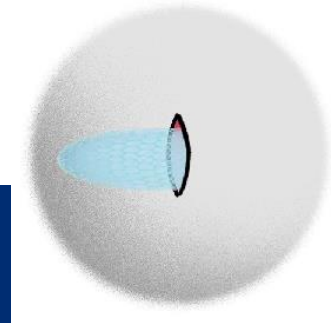
<https://vimeo.com/574600109>

Can undergo 85% compression without sacrificing mechanical strength



[www.shutterstock.com/search/dissolve](http://www.shutterstock.com/search/dissolve)

Biodegrades with time, leaving behind the natural breast shape



<https://vimeo.com/553243984>

Minimally invasive with no additional post-mastectomy surgeries needed



<https://vimeo.com/553243984>

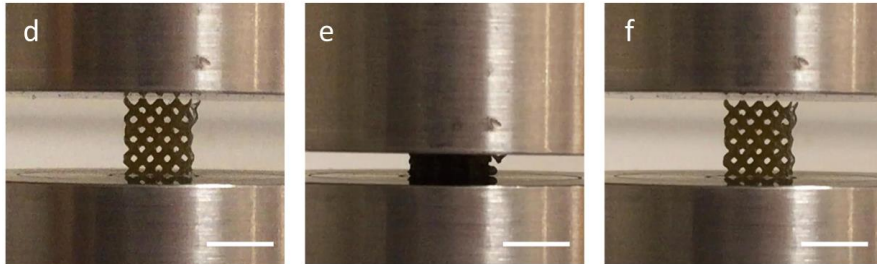
3D printing production makes this cheap and accessible



# Product Effectiveness

## Verification

- Compressibility up to 85% without catastrophic failure
- 100 loading cycles of cyclic testing:
- Yield stress – 7.4 to 5.8 MPa
- Ultimate stress – 8.4 to 8.0 MPa



## Validation

- Immediate reconstruction (over delayed reconstruction) yielded:
  - Decreased anxiety and depression
  - Improved self-esteem, body image, feelings of attractiveness, and satisfaction
- Most common reasons for not getting breast reconstruction:
  - Cost, avoiding more surgery, and fear of implants



[https://www.hopkinsmedicine.org/kimmel\\_cancer\\_center/cancers\\_we\\_treat/breast\\_cancer\\_program/treatment\\_and\\_services/survivorship/](https://www.hopkinsmedicine.org/kimmel_cancer_center/cancers_we_treat/breast_cancer_program/treatment_and_services/survivorship/)

# Better Treatments for Breast Cancer Patients

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4D Conserva® aims to provide an alternative and improved solution for breast cancer patients seeking breast reconstruction to increase their psychosocial, mental, and physical health.





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