Cornell Notes Activity on Ted Talk

Topic: The future of repairing the human body Ted Talk video by Nina Tandon (https://www.ted.com/talks/nina_tandon_the_future_of_repairing_the_human_body)
Date: January 12, 2024

Main ideas
Key points
Important people or dates

- Speaker: Nina Tandon, CEO of Epibone
- Issue? - Implants are not lasting our longer lifespan and thus needing replacement
- Use of cells to grow anatomically precise parts natural to the body with longevity
- Use of anatomical scans, 3d printing, scaffolds and stem cell cultures to generate new implants for patients
- Current work? - Current human trials with replacement of jawbone show good application and integration and outcomes with patients
- Utility in other types of implantation procedures and human needs
- continued exploration and discussion is needed regarding use

Notes and drawings

- Projected age of some humans up to potentially 115years
- Current methods of human repair are similar to carpentry in nature of replacement
- Bone is the most transplanted human material after blood
- Injured earlier in life but living longer so implants are needing to be replaced
- Ideally growing implants using cells to grow anatomically precise spare parts for the body that function and work well with the body and have longevity
- CT scan and use of 3D printing and milling to make biomaterial scaffold and infuse with stem cells and cultivate in bioreactor (cell culture robots that mimic human environment and substrates) allowing stem cells to proliferate and differentiate into different tissue types (i.e., bones, cartilage)
- Engineering times: Bone 3 weeks, cartilage four weeks and can do joints and bone throughout the body
- 2021 – greenlit by FDA to use approach in humans – 6 patients human clinical trial replacing jaw bones
    - Results: grafts fit well, integrate seamlessly, no adverse advents, with normal ADLs
- Applying to repeat with knee cartilage development
- Discussion ensues: use of alternate materials (metal, plastic, ceramic) or grow these parts with cells better aligned with the body.

Terminology:

- 3D-milling - rotating cylindrical cutter to move along multiple axes (5-Axis or 3-Axis) and create precision slots, holes, and details in an orthopedic implant. They mill or take away material as well as needed for proper placement.
- Bioreactor- mechanical devices or machines that allow for cultivation of mammalian cells under closely monitored and controlled microenvironmental conditions (temperature, pH, oxygen diffusion, nutrient transport and waste removal) to add in engineering of implants
- Greenlit - give permission to go ahead with a project (i.e., study, movie etc.)

Summary (a few sentences, what would you say to teach someone?):

Implants required for the repair of the human body are now able to be made from stem cells using anatomical scans, 3d printing and milling and bioreactors which can replace current implants of non-biological origin as shown in recent clinical trials with no adverse events and seamless integration. Similar processes can be used for alternate implants currently undertaken with the hope that biologically derived implants will last longer as we age and have greater lifespans.