Organs 3D Printing

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INTRODUCTION

Three-dimensional (3D) printing is a manufacturing method in which objects are made by fusing or depositing materials such as plastic, metal, powders, liquids, or even living cells-in layers to produce a 3D object.[1]

Charles Hull invented 3D printing, which he called “stereolithography” in the early 1980s.[1]

These technologies can build a 3D object in almost any shape imaginable as defined in a computer-aided design (CAD) file, it’s has many uses such as personal, commercial and medical uses.

MEDICAL APPLICATIONS FOR 3D PRINTING

- **Bioprinting Tissues and Organs:**

Researcher have used 3D printers to create a knee meniscus, heart valve, spinal disk, other types of cartilage and bone, and an artificial ear[1].

use of a 3D printer and CT images of a patient’s airway enabled surgeons to fabricate a precisely modeled, bioresorbable tracheal splint that was surgically implanted in a baby with tracheobronchomalacia. The baby recovered, and full resorption of the splint is expected to occur within three years.[1]

Chinese scientists working for Sichuan Revotek have successfully 3-D printed blood vessels and implanted them in rhesus monkeys.

- **Customized Implants and Prostheses:**

3D printing has been used successfully to fabricate dental, spinal, and hip implants.[1]

A research team at the BIOMED Research Institute in Belgium successfully implanted the first 3D-printed titanium mandibular prosthesis.[1]

A neurosurgeon at the Prince of Wales Hospital in Sydney, used 3D printing to print out vertebras for a patient suffering from chondroma in upper two cervical vertebra.[4]

- **Anatomical Models for Surgical Preparation:**

surgeons have used a 3D-printed model of a calcified aorta for surgical planning of plaque removal .3D model helped to redefine the surgical approach in complex CHD cases.[2][3]

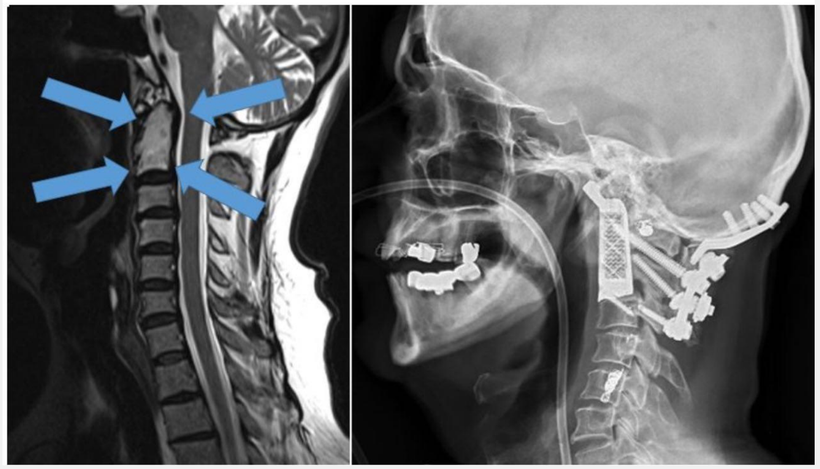

Figure1.A. On the left, showing chondroma in upper two cervical vertebra. And on the right, showing replacement of these vertebra by 3D printed implants.[4]

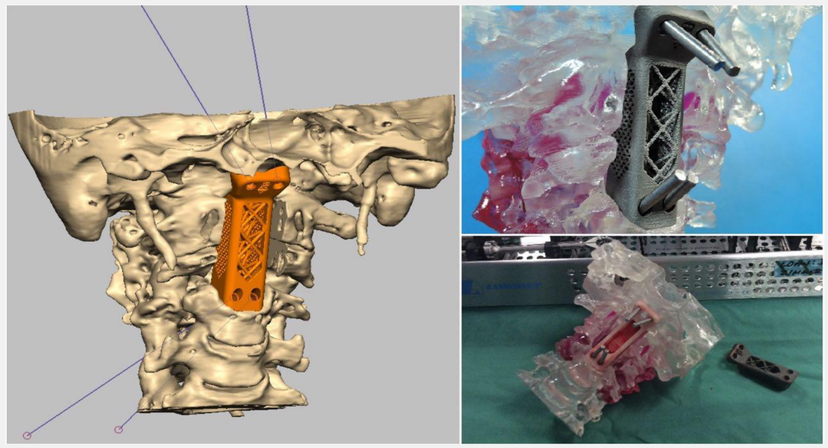

Figure1.B. showing a CAD image of patient’s vertebra for the implant design.[4]

Figure 2. On the left, showing the patient before face transplantation. And on the right showing the patient after the transplantation. [5]

Figure 3. On the left showing the patient, who lost a portion of his skull due to a construction accident. And on the right showing the use of a titanium mesh to replace part of the cranium. [6]

CONCLUSION

3D printing has become a useful and potentially transformative tool in a number of different fields, including medicine.

While 3D printing has been revolutionary in medicine, printing certain organs such as heart and liver isn’t possible for now, due to certain obstacles such as printing vasculature that could sustain the organ while being constructed and transplanted , other obstacles include ethical and funding issues.

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