

# Future Scope of Metal 3D Printing in Medical Field

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**Abstract** - During the development of 3D printing technology, the researcher was very interested in the application of 3D printing in the medical field. If we apply 3D printing technology to the medical sector, it will help us to solve very complex problems that arise during and before surgery. The Adam process in additive manufacturing will be of great help in solving complexity in the medical industry. With the help of this process, we can create many medical devices that will help us during and before surgery. Some examples are making a surgical guide for dental implants for surgery, and there are many other non-invasive devices that can be used for ADAM that can be developed with the help of metal 3D printing. This technique can be used in various medical fields like dentistry, rheumatology, surgery, etc. Important items like medical sector equipment and natural objects that must first be developed using 3D software are made utilising 3D printing technology. Once the 3D model is accessible, you can see distributed three-dimensional images of patient scans using specialised tools and software.

**Key Words:** 3D Printing, Additive, Fusion, Microscopic, Thermal Stress, Hardness, etc.

## 1. INTRODUCTION

The market for 3D printing was worth roughly \$1 per 1000 in 2018, and it is anticipated to increase to \$3.7 billion by 2026. The use of 3D printing in medicine is enormous and is almost certainly here to stay. The use of 3D printing in medicine will be among the most significant. Here, the use of 3D printing has already begun to significantly alter the medical industry. Prior to using 3D printing technology, we were unable to rehearse any lists. We will be able to employ 3D printing technology in the future by using a 3D model of the operation on which we planned the surgery so that the doctor needed less time and was able to cut Shirdi correctly [1-3].

All our medical industry hopes will be dashed by a device that will be employed. Several businesses are now able to benefit from this fantastic choice because to the advancements made in 3D printing technology over the years. In the past, 3D printing was mostly employed by powerful politicians who could afford pricey machines and materials. Medical professionals have been utilizing 3D printing technology to enhance their workflow,

particularly to give patients more individualized and reasonably priced healthcare solutions. New sentence There is a function to healthcare that has a long-term impact.

The first time that 3D printing technology was applied was in 1980. Doctor Kodama initially tried to patent this technology but was unable to finish the process. Chuck Hull was the recipient of the first stereolithography apparatus patent, which was granted to him later in 1986. He is a 3D Systems Corporation co-founder. Carl Deckard was given a wait typing method for selective legendry in the US in 1989, which was followed by the FDM method. We are going to gradually introduce a lot of improvements to the 3D printing sector. There are numerous options for 3D printing now that we are familiar with how it is done using this method and under Matter 3D Printing.

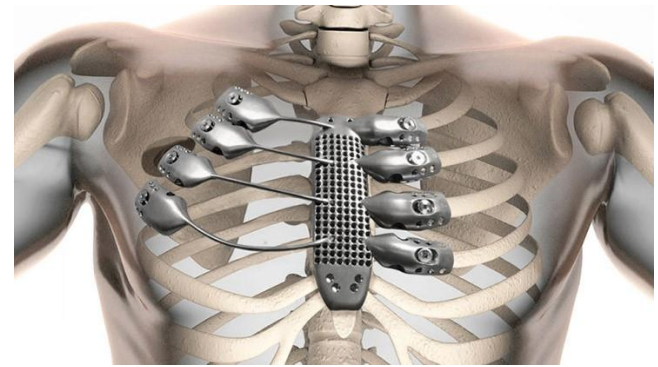
There are already more than a dozen various 3D printing methods, three or four of which have been developed specifically for metal 3D printing. This is a separate procedure that makes use of numerous materials, as well as various printer speeds, restrictions, and techniques. Almost any geometry specified in a computer-aided design (CAD) file can be translated into a 3D object using this technique [4-6].

Following the directions in the 3D files before 3D printing new ones for the object is the fundamental setup. Printed materials must be carried with codes created after slicing-rays, MRIs, and CT scans are examples of two-dimensional (2D) radiographic images that can be converted into digital 3D print files, enabling the production of complex physical and medical structures. Printed materials can be carried along the XY plane as the printer continues to follow the instructions.

## 2. SOFTWARE FOR DETAILED VISUALIZATION IN 3D PRINTING FOR THE MEDICAL INDUSTRY.

Important items like medical equipment and natural objects are produced using 3D printing. With the aid of 3D software, the objects are first developed, and after that, the model is made by travelling there. To make 3D printing easier for us, we divided it into layers and prepared it for printing using the test 3D printer. You can view this material and work with the

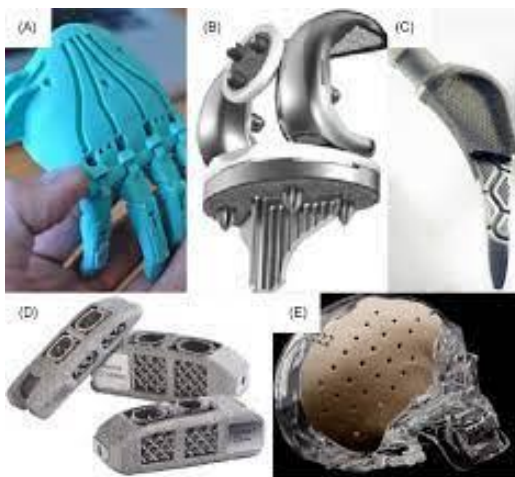
designer to ensure that it is ideal for your underprivileged application before spending money on it [6-7]. Even though they want to upgrade their 3D software, medical professionals still utilise it. Software for 3D modelling is available in a huge range. There isn't a fix that works for everyone. You must be aware of your most pressing needs. Which do you require? You only need to print it. Software that provides a more distributed view is what you're looking for. Perhaps you require both at once. There is no correct response, therefore it's crucial that you take your time and consider the advantages of each piece of software. And you may now choose which is best for your practise beyond 3D printing table dioramas for children. Important items like medical equipment and natural objects are produced using 3D printing. With the aid of 3D software, the objects are first developed, and after that, the model is made by travelling there. To make 3D printing easier for us, we divided it into layers and prepared it for printing using the test 3D printer. You can view this material and work with the designer to ensure that it is ideal for your underprivileged application before spending money on it [6-7]. Even though they want to upgrade their 3D software, medical professionals still utilise it. Software for 3D modelling is available in a huge range. There isn't a fix that works for everyone. You must be aware of your most pressing needs. Which do you require? You only need to print it. Software that provides a more distributed view is what you're looking for. Perhaps you require both at once. There is no correct response, therefore it's crucial that you take your time and consider the advantages of each piece of software. And you may now choose which is best for your practise beyond 3D printing table dioramas for children.[8].



**Figure 2:** Detailed Visualization In 3d Printing for The Medical Industry.

### 3. MAKE SPECIALIZED 3D-PRINTED TOOLS FOR THE MEDICAL SECTOR.

Although medical equipment is made to be as adaptable as possible, it might occasionally be useful to have a little customization. The equipment you require can be expensive to order and take a while to arrive. 3D printing You may quickly design your own unique utility using CT Scan [10–11]. For additional jobs, you can even design your own customised tool. Using CT scans of the patient, medical practitioners design the precise surgical tools needed for each patient and treatment. Knowing that the item will work in the situation can help you to be more prepared and effective in your job. According to studies, using a 3D printer in the medical area can speed up processes and save costs. surgery can increase ticks, especially in the oral and maxillofacial areas [12].



**Figure 1:** Metal 3D printing in medicine.



**Figure 3:** 3D Printed Surgical Tool.

### 4. CUSTOM MADE PROSTHETICS FOR PATIENTS.

Despite the fact that medical equipment is designed to be as versatile as feasible, a little customisation could occasionally be advantageous. Ordering and shipping the

necessary equipment can be expensive and time-consuming. 3D modelling Using a CT scan, you can quickly create your own special utility [10–11]. You may even create your own unique tool to perform more tasks. Medical professionals create the precise surgical tools required for each patient and treatment using CT scans of the patient. Being more organised and productive at work can be facilitated by knowing that the item will function in the circumstance. Studies show that employing a 3D printer in the medical field can expedite procedures and reduce expenses.



**Figure 4:** Prosthetic Leg Attached by Pins Inside The Body.



**Figure 5** Joint and Bone Replacement Metal 3D printed parts.



**Figure 6:** Knee Joint Replacement with Metal 3D Printing.

## 5. JOINT AND BONE REPLACEMENT.

Medical 3D printing can be used to assist repair the entire bone and joint structure, much like a prosthetic. You can utilize additive manufacturing to build specialized in-plants rather than employing a one-size-fits-all plant that frequently doesn't fit all [18]. Healthcare professionals can get started with 3D printing, which can be used for joint and body part reconstruction in addition to pre-forming bone. Here are a few of the main uses that 3D printing may be put to.

- Jaw Replacement
- hip substitute
- breast reconstruction after a knee replacement
- Reconstruction of the face

This is by no means a short list. Medical applications for 3D printing may be possible, and we are investigating this.

## 6. DENTAL APPLICATIONS OF 3D MEDICAL METAL 3D PRINTING

Dentistry Orthodontists and Dentists need customized solutions to help their patients because if they were the same, they would have to use different moulds on each mouth, so instead of making these companions with old technology [19], we 3D printed them based on X-ray and CT scan images of the patients' mouths. Instead of taking the time to make new moulds and custom-made Tax or any other thing that is required, this whole process from scanning the 3d printing to creating a 3D model to painting is done by one person. This process saves time, money, and labor. And this kid can be authorized to make custard if someone's jaw is broken, and with the help of a 3D printer, we can also add fights, and in dental[20], we can make many such tools that only email 3D printing can make possible. It can only be possible; otherwise, we cannot get them from anyone else. In today's time.



Figure 7: Dental parts printed in metal 3D Printer.

## 7. MEDICAL EDUCATION FOR DIFFICULT PROCEDURES

While planning complex or uncommon treatments, medical personnel may consult charts or scans, but they don't often receive much actual experience beforehand. Thanks to medical 3D printing, they can now [21].

2016 saw a difficult kidney transplant from a father to his 2 year old daughter being carried out by surgeons in Ireland. They developed 3D-printed replicas of an adult kidney and a child's torso to help surgeons rehearse difficult procedures and plan. The procedure went well.

Surgeons can gain the skills and expertise necessary to carry out the trickiest operations by practicing on 3D printed organs and models. With the help of this training, the surgeon will be more confident and have a better probability of success [22].



Figure 8: Metal 3D Printing.

## 8. CONCLUSION

Future Applications of Metal 3D Printing in the Medical Sector are covered in this paper. The following outcome has been concluded:

- Detailed visualizations using 3D printing for the medical industry
- Make specialized 3D-printed medical industry prostheses tools Customized for Patients
- Joint and Bone Replacement
- reconstructed jaw
- replacement hips
- Knee prostheses
- Breast augmentation
- Reconstruction of the face

1. Bioprinting Artificial Organs and Tissue
2. 3D Medical Printing for Dental Applications.
3. Medical Training for Complicated Procedures

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