

# 3D Printed Forearm Cast: A Solution To Traditional Cast?

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## **Introduction:**

Distal end radius fracture is common. Traditional cast remains key option in conservative treatment for this fracture due to cost effectiveness, easy and quick application. We proposed a method of producing patient specific 3D printed forearm cast as an alternative to surpass limitation of traditional casts, through 3D scanning and printing techniques.

## **Methodology:**

Firstly, subject wrist was kept in neutral position and elbow flexed at 90 degree. By utilizing portable handheld 3D scanner, fracture limb was scan to obtain surface geometry of the limb. This scanning process took approximately 5 minutes. The raw data will then be utilized for designing the cast using “3- Matic” software. Our prototype cast is 5cm below tip of olecranon till 1cm proximal to the metacarpal-phalangeal joint. Surface pattern with hexagonal shape holes was included for better ventilation purpose. This was then followed by splitting of cast and designing the locking mechanism. The process of design took about 1 hour. After the design stage, we proceed with printing of the cast using 3D printer. Printing time varies according to the type of the printer and the material use. The printing material we use is vero clear using the Objet printer Connex 350. Our prototype cast weigh about 100 g with 3 mm thickness. Our prototype printing time is 15 hours. Post processing was done to remove the support material which took another 1 hour.

## **Discussion:**

Despite its effectiveness in treatment of distal end radius fracture, reported

complications like loosen cast , bad odour, blister , compartment syndrome and cutaneous disease associated with traditional cast application remains hard to tackle.<sup>1</sup> Our proposed 3D-printed cast is well in place to address these issue as they featured lightweight, patient specific, and well ventilated.<sup>2</sup> Patient-specific features is important in maintaining alignment in fracture healing.<sup>1,2</sup> Besides, custom-fit structure ensures the matching surface geometry between the cast and arm and thus disperses pressure.<sup>1</sup> The ventilated structure provides extra benefits of improved patient comfort and reduce cutaneous complications.

Clinical study is still ongoing to evaluate the effectiveness of this 3D cast in holding fracture alignment. However, long printings time and cost of production remain a setback.

## Reference:

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2. Hui Lin LS, Wang D. A rapid and intelligent designing technique for patient-specific and 3D-printed orthopedic cast. *3D Printing in Medicine*. 2016;2016(2:4)