Personalised 3D biosplint for patients with rhizarthrosis

optimus 3D

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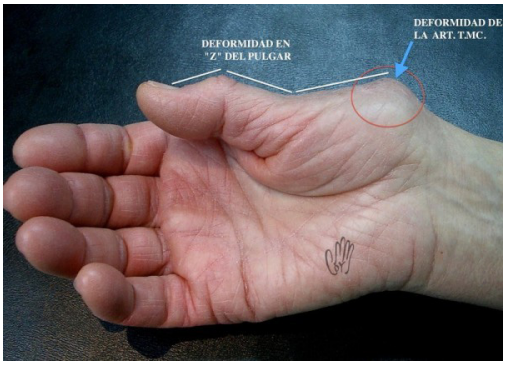
Sector: Medical

Challenge: To design and manufacture a customised orthesis to improve the ergonomics of the current health product. To prolong its use during treatment and thereby reduce the pain.

Solution: An alternative orthesis adapted to each patient with rhizarthrosis. A customised ergonomic design that is lightweight and manufactured in biocompatible material.

CHALLENGE

Hand arthrosis (rhizarthrosis) is a chronic joint disease that usually affects one or more of the articulations of the fingers and is a significant cause of disability. This condition is one of the most common reasons for visits to orthopaedists due to hand pain.



The treatment for stages I, II and III in some cases, is conservative and based on medications and rehabilitation, including the use of ortheses or splints.

Conventional splints have many drawbacks and are not ergonomic for patients who have to use them 24 hours a day:

- They impede hand movement almost completely (more than specified by clinical doctors or orthopaedists) and restrict the simplest daily activities.
- They are made in standard workshops that do not take into account each patient's anatomy.
- Non-breathable fabric (sweating).

SOLUTION

Optimus 3D proposes an innovative solution consisting in splints adapted to each patient and overcoming the drawbacks of conventional orthopaedic ortheses, thereby improving patient comfort.

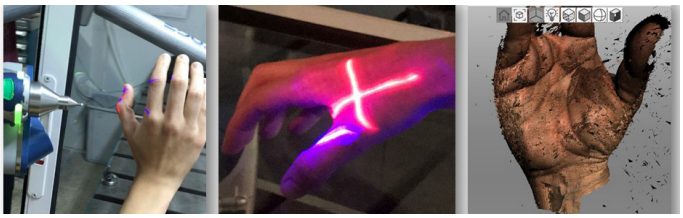
It is noteworthy to mention the work of an interdisciplinary team who based the design on the requirements and counsel of the orthopaedics team. The collaboration between doctors and biomedical engineers was key for the success of a product that is ideal and customised for each patient and their circumstances.

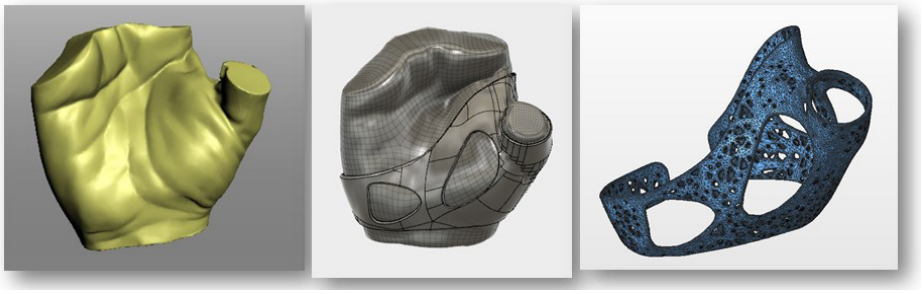
The design and manufacturing process for the splint is summed up in the following 3 steps:

1. Digitalisation of patient anatomy using a portable 3D scanner.

2. Designing an orthesis adapted to the anatomical mesh of the scanned patient. The engineering team will carry out the design based on the specifications indicated by the doctor in each case.

3. Manufacture of the splint using additive technology (3D printing) HP-MultiJet Fusion and PA12 material (biocompatible; cytotoxicity and skin irritation tests).





ADVANTAGES

The 3D biosplint project is an opportunity to develop a new 3D orthesis that will be a qualitative leap in the search for an intelligent solution for patients with rhizarthrosis.

The project was undertaken in conjunction with BIOEF and the orthopaedic team of Basurto (Osakidetza).

In the clinical trial (concept test) and with constant counsel provided by the doctors, the ortheses were tested and validated with satisfactory results.

The splints have a series of advantages as regards both their manufacture and their use by patients, among which the following can be highlighted:

- Greater precision in splint design to place it on the affected area.
- Lower splint weight for greater comfort.
- Improvement of breathing properties.
- Resistance to water, which improves hygiene and allows the patient to bathe while wearing the splint.
- Greater mobility, as the "pincers'" movement is not affected.
- Allows air circulation.
- Improved aesthetics: simple splint design; the splint can be covered with gloves if desired by the patient.
- Manufacturing times: the 3D model is made in 3 hours and can be used by the patient in 4 days.
- Biocompatible PA12 material with excellent mechanical properties that prolong the useful life of the product.

The data of the clinical trial with patients have been collected over three visits in the Basurto Hospital.

The results of the statistical analysis show ergonomic improvement in most cases and therefore longer use of the splint during treatment. The initial project hypothesis that considers the 3D biosplint to be a health product that offers improved ergonomics compared to the conventional splint and improves patient treatment is therefore validated.