axial3D
Patient data made real

Case Study

Orthopedics

Twisted Radius And Ulna

Use of Axial3D model to aid in the diagnosis and preoperative planning of congenital deformity in pediatric forearm.

Abstract

A patient specific physical 3D printed model provided better insight into the pathology leading to a drastic reduction in theatre time and optimum result for the patient.

Clinician

Mr. Michael Eames, Consultant Orthopedic Surgeon

Healthcare Provider

Ulster Hospital, Northern Ireland

> Having a tangible scale piece of anatomy provides huge insight into the pathology not possible on conventional CT or MRI scans. Access to the model changed the standard treatment indicated by the CT scans for a 4 hour complex osteotomy to a simple, much less invasive 30 minute soft tissue procedure.

Mr. Michael Eames, Consultant Orthopedic Surgeon,
Ulster Hospital, Northern Ireland

Case

A young male patient was admitted to the Ulster Hospital with problems in supination and pronation of the forearm. Due to the amorphous arrangement and the complex 3D rotation of the bones, a comprehensive understanding of the extent of the patient's deformity was difficult to conceptualise using CT scans alone.

Solution

The surgeon was provided with a 1:1 scale physical 3D printed model of the complex deformity of both the radius and ulna. The bones were separately printed to allow articulating movement to be mimicked as if the bones were in situ.

FIG 1

Proximal articular surface of the radius showing 3D rotation.

FIG 2

Distal aspect of ulna.

FIG 3

High resolution SLA models of full radius and ulna showing 3D rotation.

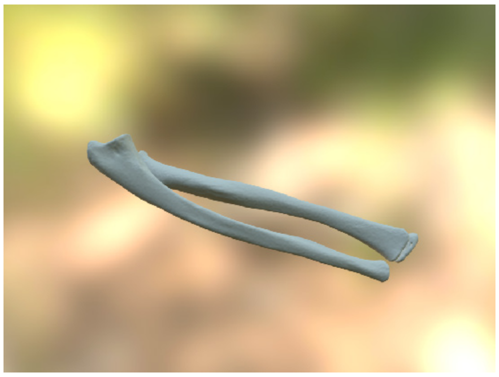

FIG 4 (Left)

Surgeon rotating arm to mimic articular movement in forearm to assess the loss of space.

FIG 5 (Right)

3D interactive visualization used to explain procedure to patient and parents.

Result

The physical 3D model offered a much better view and understanding of the 3D rotation of the forearm anatomy which allowed for accurate diagnosis of the patient's pathology. With the physical model, it was discovered that the loss of space was not, as originally thought, due to the bones deformity but rather the soft tissues that had scared down the interosseous membrane. The course of treatment was updated accordingly.

Conclusion

Using the physical 3D printed models to assess the patient's anatomy outside the body in full scale enabled the surgeon to assess the 3D rotation, improve the diagnosis and determine a more appropriate treatment for the patient. The surgery time was reduced by over three hours, decreasing the time the patient spent under anesthesia, in post-operative care and his ensuing rehabilitation.

Benefits

Patient

Elevating Patient Care

- Faster treatment
- Reduced time in theatre with less invasive surgery
- Rapid recovery
- Reduced complications

Clinicians

Advancing Surgical Standards

- Greater insight led to improved diagnosis
- More accurate treatment
- Clearer communications with the patient and medical team

Healthcare Provider

Improving Standards and Efficiencies

- Increased standards of care
- Reduced risk of complications and infections
- Saved time and money in surgery and post-operative care

Model Specifications

Patient Data:	732 CCT images							
Color:	White	☒	Grey	☐	Clear	☐	Clear with Contrast	☐
Layout:	In-situ	☐	Separate	☒				
Construction:	Solid	☒	Hollow	☐	Split	☐		
Process and Delivery:	48 hours							

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