



**materialise**

innovators you can count on

# CT/CBCT SCAN PROTOCOL

Materialise Personalized Solutions - CMF

## Purpose and Summary

This protocol describes the guidelines for a CT or CBCT scan for ordering the following:

- Materialise SympliciTi  
(Materialise Titanium 3D Printed Guides & Plates)
- Materialise PorousTi  
(Materialise Titanium 3D Printed Implants)
- Materialise Guides
- Materialise Splints
- Materialise Anatomical Models

## Important

- Use of this scanning protocol as a guideline will result in a more anatomic accurate model, surgical guide, and/or implant.
- CBCT scans are not accepted for Materialise Titanium 3D Printed orbital and cranial implants.

### WARNING:

Personalized devices will be designed to fit the patient's anatomy based on the CT, CBCT, intra-oral scan or dental impressions. Changes in the patient's anatomy occurring after the CT, CBCT, intra-oral scan, may result in a suboptimal fit of the device. Surgery should not be done later than 6 months from the scan or dental impression date.

Due to potentially lower accuracy of dental surfaces provided by CT/CBCT scans, it is preferred to provide a high resolution scan of the patient's dentition (e.g. intra-oral scans, optical scan or CBCT scan of plaster casts) or plaster casts to Materialise.

## Preparation of the patient

- Remove any non-fixed metal prosthesis or jewelry that might interfere with the region to be scanned.
- Non-metal dentures may be worn during the scan.
- Make the patient comfortable and instruct not to move during the procedure. Normal breathing is acceptable but any other movement, such as tilting and/or turning the head, can cause motion artifacts that compromise the reconstructed images, requiring the patient to be rescanned.
- Stabilize the relationship of the jaws during the scan. The patient is preferably scanned with a very thin bite wafer that does not influence the facial soft tissues.

During scanning, the position of the lower jaw needs to be controlled. The patient should be scanned in occlusion with the condylar heads in centric relation. This occlusion needs to be in a relaxed position without clenching the teeth or posturing the lower jaw. A pre-scan occlusion training or a thin non-radiopaque bite wafer that allows contact points between the teeth can be used to achieve this position. This bite wafer should not influence the surrounding soft tissues such as the lips.

## Reconstruction of the images (CT or CBCT)

- Use a proper image reconstruction algorithm to get sharp reformatted images for locating internal structures such as the alveolar nerves. Use the sharpest reconstruction algorithm available (usually described as bone or high resolution).
- Reconstruct the images with a  $512 \times 512$  matrix or  $768 \times 768$  matrix.
- Only the axial images are required, no additional reformatting of the images must be done.
- Save the images in uncompressed standard DICOM format.
- Choose appropriate image modality during export of images. Non-corresponding modality can be a reason for rejection of images.

## CT Scanning Instructions

- Use only primary axial images.
- Images scanned under a gantry tilt and oblique or reformatted images negatively influence the accuracy.
- All slices must have the same field of view, reconstruction center, and table height.
- Scan each slice in the same direction.
- Scan with the same slice spacing, less than or equal to the slice thickness. Non-overlapping axial slices may decrease the quality of reformatted images.

## Patient Positioning

- Place the patient supine on the scanner table and move the patient into the gantry, head first. Adjust the table height in order to position the patient's head in the field of view of the scanner.
- Stabilize the patient's head using a headrest without deforming the facial soft tissues (do not use chin-cups or straps). The patient's head must not move.
- Minimize the artifacts caused by metallic dental restorations or orthodontic brackets by aligning the patient's occlusal plane as much as possible with the axial slices.

# CT/CBCT SCAN PROTOCOL

Materialise CMF Personalized Solutions

- Depending on the product or service requested, the field of view should include:
- Nose and chin
  - Left and right temporomandibular joint (TMJ)
  - Other regions of interest if required (ex. cranium)
  - For reconstruction cases the complete tumor/defect

## CT Scan Parameters

### General

Gantry tilt/oblique angle	0°
Reconstructed slice increment	≤ slice thickness
Reconstruction algorithm	Bone or high resolution

### Head

	Slice thickness		Pixel size
	Recommended	Maximum	Maximum
Cases without splints	1.0 mm	1.25 mm	1.0 mm
Cases with splints	1.0 mm	1.25 mm	0.5 mm
Cases with splints based on CT data	0.3-0.5 mm	0.75 mm	0.3 mm

### Bone grafts

	Slice thickness		Pixel size
	Recommended	Maximum	Maximum
Fibula graft	1.0 mm	5.0 mm	1.0 mm
Scapula, hip, rib graft	1.0 mm	2.5 mm	1.0 mm

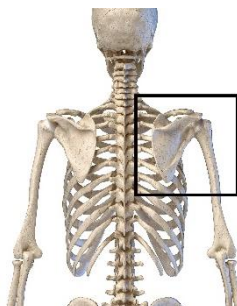
Note: For a free-flap (fibula, rib, hip, scapula) reconstruction, please send us images of the graft donor site.

### Required field of view for

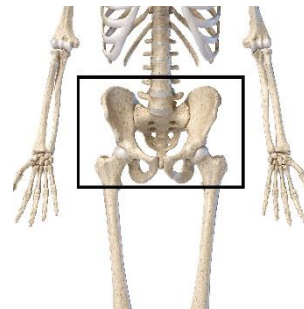
#### Fibula graft



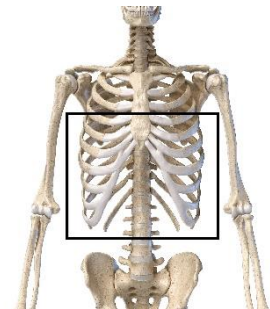
#### Scapula graft



#### Hip graft



#### Rib graft



## CBCT Scanning Instructions

### Patient Positioning

- Position the patient seated, with a natural head position, with the jaws in centric relation (CR).
- Do not deform the soft tissue (no chin cups, no straps).
- The field of view should include:
- Nose and chin
  - Left and right temporomandibular joint (TMJ)
- Region of interest should be at least at 10 mm from the border of the field to avoid possible border distortion effect.

## CBCT Scan Parameters

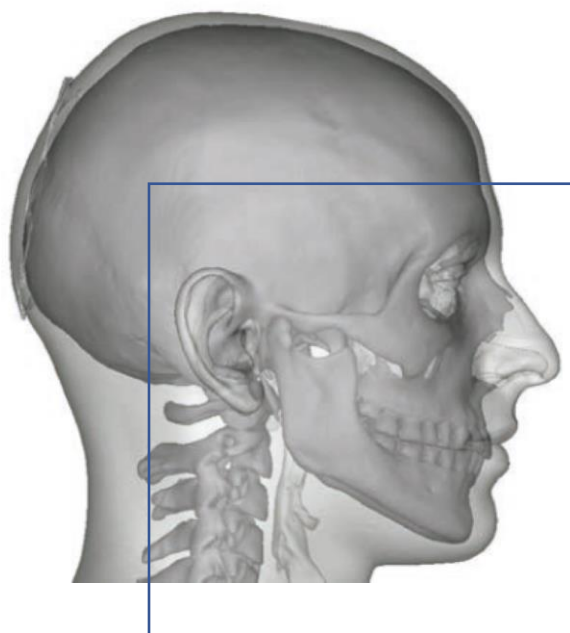
### General

Field of view	Largest available
Scan time	Longest available

### Device specific

Cases including:	Voxel Size	
	Recommended	Maximum
Titanium 3D Printed Guides, Plates & Implants*	0.3 mm	0.4 mm
Anatomical models, guides and splints	0.3 mm	0.5 mm
Splints based on CBCT data	0.2 mm	0.3 mm

\* CBCT scans are not accepted for orbital and cranial implants



Required field of view for  
orthognathic cases

## Dentition Scanning Instructions

### Intra-oral scan of patient's dentition

- Use a latest generation intra-oral scanner, providing full-arch impressions with highest precision and resolution.
- Provide mandible, maxilla and occlusion scans in .STL format.

### Optical scan of dental casts

- Use a latest generation optical scanner, providing full-arch impressions with highest precision and resolution.
- Provide mandible, maxilla and occlusion scans in .STL format.

### CBCT scan of dental casts

- Position the casts in the CBCT scanner similar to the patient scan and with the occlusal plane as horizontal as possible.
- Provide a first scan with mandible and maxilla separated by means of a foam, and a second scan with mandible and maxilla in planned occlusion.

Field of view	Largest available
Scan time	Longest available
Voxel size	Recommended: 0.1 mm Acceptable: 0.3 mm

### Additional data:

(3D) patient photos and cephalometric data may be uploaded in Materialise SurgiCase Online <https://surgicaseoos.materialise.com> with the CT/CBCT data.

Manufactured by Materialise NV.

For questions, please contact our customer service at:

[cmf@materialise.com](mailto:cmf@materialise.com) Phone: +32 16 39 66 49

This is version 2 of this document issued in September 2021.

Materialise and the Materialise logo are trademarks of Materialise NV.

Materialise NV © 2021