Ankle Replacement Surgery With The Anatomic Total Talar Prosthesis Using Three Dimensional Computed Tomography And Computer-Aided Designs

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CONFLICT TO DISCLOSE

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- Chayanin Angthong, M.D.
- My disclosure is in the Final AOFAS Mobile App.
- I have a potential conflict with this presentation due to: financial support from SCom company, and Phoenix company (Thailand) to attend the meetings
The purposes of this study are to report the techniques in development of three-dimensional (3D) artificial talus and its clinical use in a patient with a total talar loss.
A male patient who underwent the total talar prosthesis replacement (TPR) via anterior approach.

The patient age was 25 years.

The cause of his ankle problem was severe traumatic loss of the entire talus.

The duration of symptoms before the definitive treatment was approximately 3 months and the follow-up time was 4.6 months.

Total Talar Loss

Angthong C.
Anatomic total talar prosthesis replacement surgery and ankle arthroplasty: an early case series in Thailand.
Baseline clinical and radiographic data, including Visual Analog Scale Foot and Ankle (VAS-FA), and Health-related Quality of Life via Short-Form 36 (SF-36) scores, were collected for the patient.
A custom iTalar-M prosthesis was implanted in this patient. This prosthesis was manufactured as a custom-made implant for this patient by the author and colleagues using three-dimensional computed tomography (3D-CT) imaging of the contralateral talus with computer graphics (computer-aided design: CAD), and development with medical grade (biocompatible stainless steel).
Custom Model from 3D-CT

A reconstructed image from 3D-CT and CAD development
The custom prosthesis in the current study consisted of:

1. Trochlea tali central arc length (TaALc: a distance between the most anterior and posterior and proximal points of the trochlea tali, as seen in the sagittal projection of the talus or our talar prosthesis) as 35.1 mm.

2. Trochlea tali width [TaWc: a width between medial and lateral crests of the talar dome at central location along mediolateral (M/L) axis] as 27.8 mm.

These distances were in the ranges of same parameters in the previous studies. The three-dimensional computer graphics-based talar morphometry with computed tomography was analyzed and compared with the previous studies. The mean ratio of the anteroposterior (length) and medio-lateral (width) dimensions of the trochlea tali (TaALc/TaWc) of a custom prosthesis in the current study was in the range among the same ratios of previous studies.

These evidences confirmed the anatomic design of total talar prosthesis in the current study.

Results

- From preoperative to postoperative, the VAS-FA score increased from 6.0 to 57.5, the SF-36 score increased from 19.3 to 73.7.
- Dorsiflexion increased from 0 to 5 degrees, the plantarflexion increased from 0 to 16 degrees, and the total ankle motion increased from 0 to 21 degrees.
- Preoperative and postoperative inversions were 0 and 10 degrees, and the eversions were 0 and 13 degrees.
- No complications were found. There was no sign of prosthesis migration at the last follow-up visit for this patient.
- The patient was able to return to stand and walk as full-weight bearing without gait aid. He was able to mobilize and perform his activity-daily living by himself with more convenience. His quality of life was substantially improved at the latest follow-up period (9 months after surgery).
Conclusion

- Artificial talus with our development by 3D-CT and CAD is proved to be anatomic via several parameters as shown.
- This prosthesis provided satisfactory outcomes for the treatment of talar loss in a short-term follow-up.
- This treatment was able to satisfactorily improve the functional outcomes and quality of life in a patient of the current study.
References


