

Clinical and Radiographic Evaluation of Total Ankle Arthroplasty with Custom Image Measurement Software.

Shinichi Kosugi, MD, Yoshinori Takakura, MD, PhD, Yasuhito Tanaka, MD, PhD, Yuki Matsumoto, Masanao Koeda, Doctor of Engineering

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Introduction/Purpose: Ceramic 2-component total ankle prosthesis, TNK-Ankle, has been used clinically as standard prosthesis in severe ankle osteoarthritis or rheumatoid arthritis for long years in Japan. Two-component prosthesis would require more precise replacing because of more constraint than mobile type. We would report the outcomes of total ankle arthroplasty (TAA) with TNK-Ankle investigated radiographically using custom image measurement software and compared with clinical scores.

Methods: Twenty four cases of total ankle arthroplasty with TNK-Ankle for osteoarthritis in stage 3b and 4 operated by an expert surgeon from 2009 to 2013 have investigated on X-rays of preoperative unaffected and postoperative affected ankles. Clinical outcomes by JSSF score based on AOFAS score and SAFE-Q, patient-based questionnaire, were compared with radiographic measurements. Image analysis performed with custom OpenCV software programmed for this study. This could match translucent X-ray images, an unaffected lateral ankle image and an implanted lateral ankle image with TNK-Ankle, and measure differences in geometry of ankle joint for tibia and talus between two images.

Results: Postoperative clinical outcomes were improved from preoperative on JSSF (from 57 to 90) and generally affirmative on each item of SAFE-Q at forty-six months follow-up. But three ankles had some subsidence and loosening of prostheses, two ankles needed revision surgeries. Their ankles were classified for revision and loosening group, and the other ankles were classified for non-loosening group. X-ray image measurements with the custom software had elucidated two dimensional geometry of postoperative implanted ankle compared to preoperative unaffected ankle joint and its differences between two groups. In Revision and loosening group, the top of tibial plafond of tibial component of TNK-Ankle was placed 7mm anterior to the top of unaffected tibial plafond and more than 4mm anterior in non-loosening group. Inclination of component in loosening and revision group was a little more than in non-loosening group.

Conclusion: In this study it was indicated that a few case may have loosening and revision after TAA even if it was performed on correct indication and by an expert surgeon, and clinical results may be concerned in geometry of implanted ankle. Precise replacing of total ankle prostheses by means of navigation and image-guided surgery may produce better results means. Data accumulation by more radiographic measurements with digital tools must become useful for future navigation system. Custom-made software development suitable to research demand like this study would be more efficient.

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