

## An artificial intelligence-based GPT decision aid for single versus two-stage total ankle arthroplasty in coronal deformities

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Total ankle arthroplasty (TAA) in patients with coronal plane deformities, such as varus  $>10^\circ$  or valgus  $>15^\circ$ , requires precise preoperative planning to ensure successful outcomes. Complex cases often involve associated procedures (e.g., osteotomies, ligament reconstruction) and increased surgical time, which may favor a staged approach. To support clinical decision-making, we developed an AI-based tool using Generative Pre-trained Transformer (GPT) technology tailored to foot and ankle surgery. This customized GPT assists surgeons in deciding between single- and two-stage TAA based on six core factors: deformity magnitude and origin, ligament instability, need for associated procedures, patient comorbidities, local tissue condition, and estimated total operative time. The system recommends a two-stage approach when the total surgical time exceeds 150 minutes and provides a structured form to estimate the duration of each surgical step. This AI-based GPT was designed as an interactive assistant for use during surgical planning, improving consistency and promoting safer decision-making in complex deformity cases. It also suggests further actions in cases of diagnostic uncertainty, such as image analysis or direct input from the surgeon. This is, to our knowledge, the first GPT specifically trained for total ankle replacement decision support. The tool is currently undergoing validation and is accessible for clinical use

**Keywords:** Arthroplasty, replacement, ankle; Patient reported outcome measures; Artificial intelligence.

**DOI:** <https://doi.org/10.30795/jfootankle.2026.v20.2060>

This abstract was presented at the XXII Brazilian F&A Meeting 2026, held in São Paulo, Brazil, from April 18 to 21, 2026.