Incidence of Complications During the Surgeon Learning Curve Period for Primary Total Ankle Replacement

A Systematic Review

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KEYWORDS

• Arthroplasty • Complications • Prosthesis • Tibiotalar joint • Surgery

KEY POINTS

- Advances in technology for total ankle replacement have renewed the popularity of this procedure as an alternative to ankle arthrodesis.
- A systematic review of the world literature reveals that the overall incidence of complications encountered during the surgeons' learning curve period for primary total ankle replacement, regardless of prosthesis system, is 44.2% (1085 of 2453).
- The rate of a complication progressing to failure carries more clinical importance than the general incidence of any complication.
- A comparison of 2 classification systems reveals conflicting data as to whether an acceptably low incidence of high-grade complications leading to ultimate total ankle replacement failure exists during the surgeon learning curve period.
- A validated classification system is needed to allow more standardized reporting of complications encountered in the surgeon learning curve period for primary total ankle replacement.

INTRODUCTION

The emergence, initial failure, and subsequent resurgence of total ankle replacement (TAR) as a viable alternative to ankle arthrodesis for the treatment of end-stage ankle arthritis is well documented.[1–8] Improved surgeon training and usage of current-generation TAR systems have produced better patient outcomes.[1–13] As a result,

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foot and ankle surgeons competent in primary TAR have now achieved outcomes comparable with, if not superior to, ankle arthrodesis[1–3,11]; however, there is a learning curve for surgeons during their initial use of various TAR systems.[1–10,12] As clinicians progress further into the reality of primary TAR being more routinely performed, revision TAR will also continue to become more common. It is reasonable to assume that most complications leading to revision will occur during the surgeons' learning curve period of primary TAR. However, although many reports suggest the presence of a learning curve, there is no published analysis of the exact incidence of complications encountered during the surgeons' learning curve period for primary TAR, regardless of prosthesis system. This article provides such an analysis, in order to establish data by which patients and surgeons alike can expect to encounter the various complications specific to primary TAR during the surgeons' learning curve period. Furthermore, it is hoped that this may then afford surgeons a benchmark by which to compare the safety of primary and revision TAR during their learning curve period.

MATERIALS AND METHODS

We used the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) guidelines.[14] Accordingly, electronic databases and relevant peer-reviewed sources including OvidSP/MEDLINE (http://ovidsp.tx.ovid.com) and PubMed (http://www.ncbi.nlm.nih.gov/pubmed/) were searched from inception to August 2014 with no restriction on date or language, and using an inclusive text word query "ankle" AND "replacement" OR "arthroplasty" OR "implant" OR "prosthesis" AND "learning curve" in which the uppercase words represent the Boolean operators used. Only articles that specifically reported a surgeon's initial patient cohort undergoing primary TAR, regardless of system, and that included all complications encountered during this learning curve period were considered. The references from the identified studies were individually searched for additional potentially pertinent published works, which were then obtained for review. We also manually searched common American, British, and European orthopedic and podiatric scientific literature for relevant articles. In addition, by using various combinations of the text words listed earlier, an Internet-based scholarly literature search engine, specifically Google Scholar (http://scholar.google.com/; last accessed August 8, 2014) was used to identify available sources that could potentially provide useful information.

Both authors reviewed all the articles and complete agreement was necessary for final inclusion, with the lead author being the moderator. Only full-text, published articles were considered. No reports were excluded based on an inability to obtain them. If the reference was not written in English, the contents of the reference were translated from its native language of French or German to English using an Internet-based translator (Google Translate; available at: http://translate.google.com/#; last accessed August 8, 2014).

In addition, the level of evidence of each individual study was determined according to the evidence-based medicine grading system recommended by the American College of Foot and Ankle Surgeons (http://www.jfas.org/authorinfo; last accessed August 8, 2014).

RESULTS

The search for potentially eligible information for inclusion in the systematic review yielded a total of 351 articles. After considering all the potentially eligible articles, 25 (7.1%) studies met our inclusion criteria (**Fig. 1**), involving a total of 2453 TARs (2414 patients) and 12 different TAR systems (**Table 1**). In the studies that included