



Time-related Learning Curve of Robotic-arm Assisted Total Knee Arthroplasty

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INTRODUCTION

While robotic-arm assisted TKA may theoretically offer improvements in precision, concerns over increased operative time, especially during the learning period, remain a major barrier. Our aim was to determine the duration of the learning phase with robotic TKA and, subsequently, to compare surgical time after the learning period with that of conventional TKA.

MATERIALS AND METHODS

We conducted a prospective study evaluating two surgeon's initial experience with robotic-arm assisted TKA. Each surgeon performed a minimum of 20 robotic TKA cases (n=45), which were then compared to conventional TKA cases (n=48) from the same period. Time points measured included (1) tracker placement (pin time), (2) landmarks and anatomic registration (registration time), (3) bone preparation and cutting (cutting time), and (4) ligament balancing and implant trialing (trialing time). An aggregate of the aforementioned intervals (arthroplasty time) was used to determine the learning period. Analyses were performed with asymptotic regression.

RESULTS

With a steady state arthroplasty time of 26.7 minutes (SE 1.8), surgeons achieved 95% of learning after 13 robotic TKA cases (95% CI, 6-27 cases).

FIGURE 1

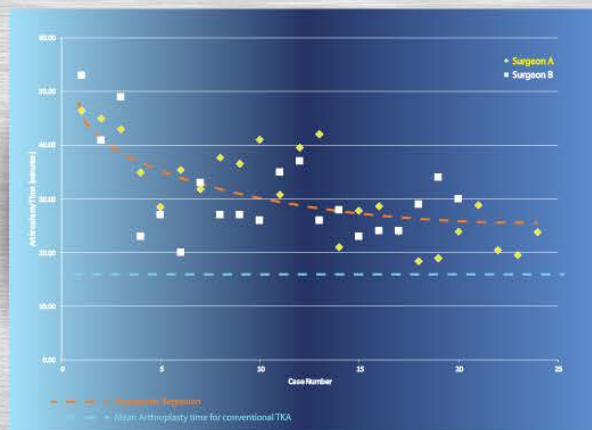


Figure 1. Arthroplasty time for robotic-arm assisted TKA during the learning period.

RESULTS

Thereafter, mean arthroplasty time was 24.9 (18.4-34.0) minutes, a reduction of 22.8 minutes from the first three cases. Mean pin time was 3.4 minutes (4.2 minute reduction), registration time was 4.8 minutes (5.3 minute reduction), cutting time was 7.8 minutes (5.8 minute reduction), and trialing time was 8.9 minutes (7.3 minute reduction). In comparison, mean arthroplasty time for conventional TKA was 15.1 (6.4-24.6) minutes, a difference of 11.6 minutes from the steady state with robotic TKA. Cutting time for conventional TKA was 8.2 (3.6-16.0) minutes and trialing time was 7.0 (2.2-15.3) minutes.

DISCUSSION

Surgeons can expect to overcome the learning period and its inherent difficulties during the first 10-15 cases with robotic-arm assisted TKA, after which there is a marginal increase in surgical time compared with conventional TKA.

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