Time Efficiency of a Smart Tool for Hip Navigation

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INTRODUCTION:

The use of surgical navigation in Total Hip Arthroplasty (THA) can improve the accuracy of cup positioning, which is a common cause of dislocation after surgery[1]. However, adoption of navigation techniques has been limited due to surgeon concerns, including the additional time in surgery required to navigate the cup. We evaluated the interoperative time requirements of the HipXpert System[2,3,4], a personalized, mechanical navigation device over the first four years of use for the senior author, a high-volume hip and knee surgeon.

METHODS:

Using operating room records from the New England Baptist Hospital, we analyzed the time from incision to closing for all primary THA performed by the senior author from 1/2015 to 10/2018. 1,374 total procedures were identified, 328 using the HipXpert device, and 1,046 using traditional, non-navigated surgery. Intraoperative time defined from incision to closing was compared with a two tailed student's T test for cases using the HipXpert device and those that were traditionally non-navigated. Analysis was performed using STATA 15[5].

RESULTS:

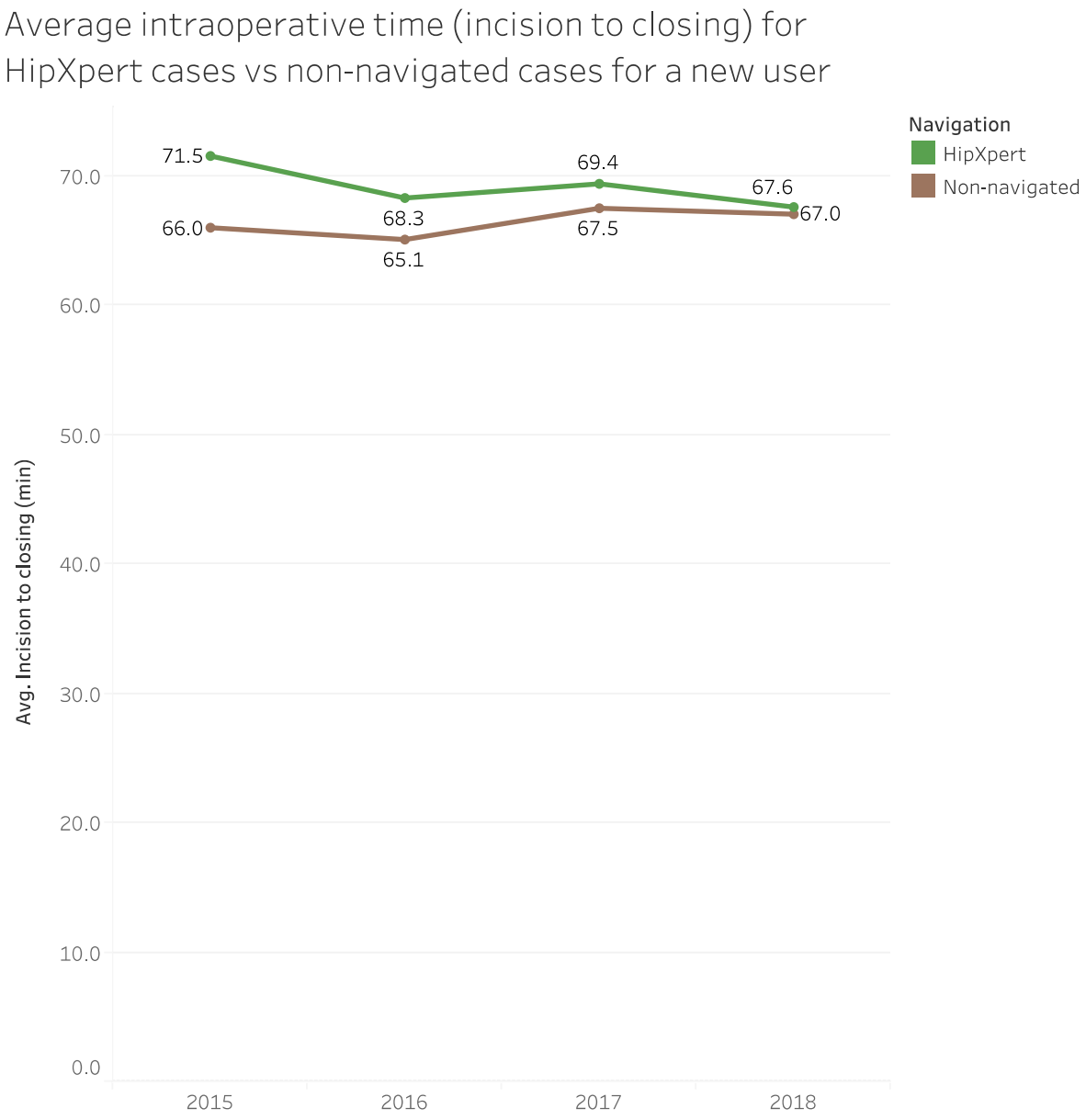
Average interoperative time over the four year period was 66.4 min in the traditional cases and 68.9 min in the HipXpert group (mean difference, 2.5 min; $p < 0.001$). When compared to cases in the same year, cases navigated with the HipXpert device were 5.7 min longer (66.0 vs 71.5; $p = 0.004$) in the first year of use (2015), 3.2 min longer (68.3 vs 65.1; $p = 0.015$) in the second year of use (2016), 1.8 min longer (69.4 vs 67.5; $p = 0.044$) in the third year of use, and no different (67.6 vs 67.0; $p = 0.330$ in the fourth year of use (**Figure 1**).

DISCUSSION AND CONCLUSION:

The average additional time in the OR associated with use of the HipXpert device was 2.5 minutes over the 4 year period. A learning curve was identified, with additional time dropping from 5.7 minutes longer initially to a non-significant 0.6 minute difference in intraoperative time after several years of use. This demonstrates that accurate cup navigation is possible without adding significant intraoperative time, and the HipXpert may be of benefit to surgeons who wish to achieve optimal outcomes without sacrificing efficiency in the OR.

1. Brooks, P. J. "Dislocation following total hip replacement: causes and cures." The bone & joint journal 95.11_Supple_A (2013): 67-69.
2. Murphy SB. Total Hip Arthoplasty Using the Superior Capsulotomy Technique. Inst Course Lect 2013;62:245-250.
3. Steppacher SD, Kowal JH, Murphy SB. Improving cup positioning using a mechanical navigation instrument. Clin Orthop Relat Res (2011) 469:423-428.
4. Jennings JJ Randell TR, Green CL, Wellman SS. Independent Evaluation of a Mechanical Hip Socket Navigation System in Total Hip Arthoplasty. J Arthrplasty 2016 Mar; 31(3):658-61.
5. StataCorp. 2017. *Stata Statistical Software: Release 15*. College Station, TX: StataCorp LLC

Figure 1:


Average intraoperative time (incision to closing) for HipXpert cases vs non-navigated cases for a new user
Navigation
HipXpert
Non-navigated
Avg. Incision to closing (min)
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
71.5
69.4
67.6
68.3
66.0
67.5
67.0
65.1
2015
2016
2017
2018