Improved accuracy of component positioning with robotic-assisted unicompartmental knee arthroplasty: data from a prospective, randomized controlled study

Stuart W. Bell, MBChB, MRCP, FRCS(T&O), Iain Anthony, PhD, Bryn Jones, MBChB, FRCS(T&O), Angus MacLean, MBChB, FRCS(T&O), Philip Rowe, BSc(Hons), PhD, and Mark Blyth, MBChB, FRCS(T&O)
Investigation performed at the Department of Orthopaedics, Glasgow Royal Infirmary, Glasgow, United Kingdom

Publication

Journal of Bone and Joint Surgery (2016) 98: 627-35

Goal of study

To evaluate the accuracy of component positioning to plan for unicompartmental knee arthroplasty (UKA) comparing robotic-arm assisted and conventional surgical techniques

Materials and methods

- Prospective, single-blinded, randomized controlled trial (level I evidence)
- 139 patients randomly assigned to:
  - Mako UKA: received robotic-arm assisted medial UKA
  - Manual UKA: received manual procedure using Oxford Phase-3 unicompartmental knee replacement
- A post-operative CT scan was performed at 3 months to assess the accuracy of the planned vs. achieved component positioning in the axial, coronal, and sagittal planes

Results

- Data collected for 120 patients:
  - 62 Mako UKA
  - 58 manual UKA
- Intraobserver agreement good for all measured component parameters
- Mako Partial Knee showed more accurate component positioning to plan with lower root mean square (RMS) errors and significantly lower median errors in all six component parameters ($p<0.01$) (**Table 1**)
- The proportion of patients with component implantation within 2 degrees of the target position was greater for Mako Partial Knee compared with the manual cohort with significance in 5/6 parameters ($p<0.05$) (**Fig. 1**)

Conclusion

UKA with Mako Partial Knee led to improved accuracy of component positioning to plan compared with conventional surgical techniques

Component median implantation errors			
	Mako UKA group*	Manual UKA group*	P value
Femoral sagittal	1.9 (0.8, 2.9)	3.9 (2.0, 7.8)	0.0001
Femoral coronal	1.4 (0.6, 2.3)	4.1 (1.8, 5.8)	0.0001
Femoral axial	1.9 (1.1, 3.3)	3.6 (2.0, 5.9)	0.0001
Tibial sagittal	1.0 (0.7, 1.8)	3.7 (2.3, 5.6)	0.0001
Tibial coronal	1.6 (0.8, 3.0)	2.7 (1.6, 3.7)	0.0089
Tibial axial	2.2 (1.1, 3.4)	5.4 (2.8, 9.3)	0.0001

*The values are given as the median error in degrees, with the first and third quartiles given in parentheses

Table 1
Component median implantation errors

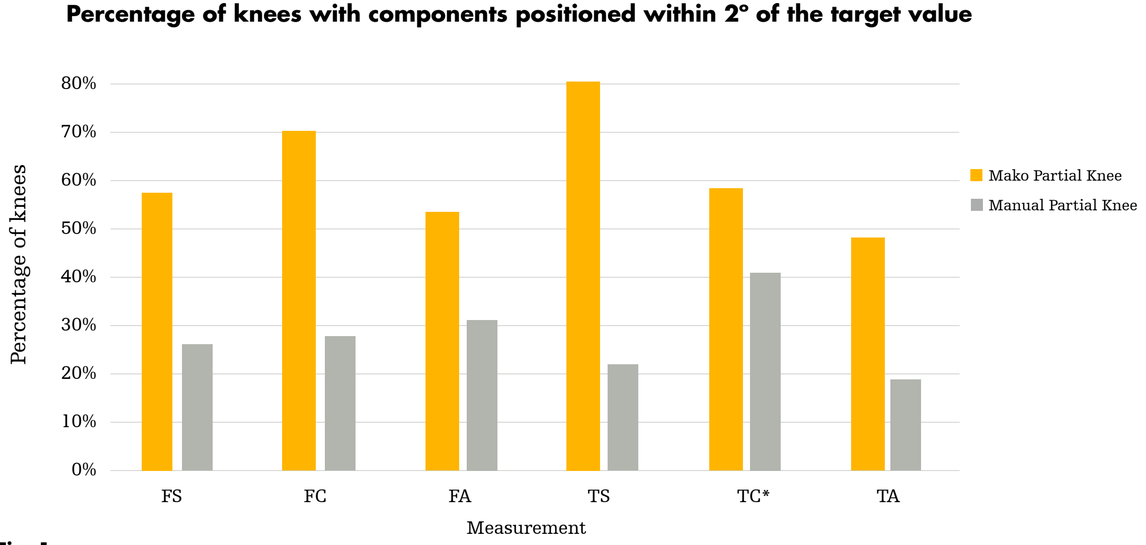

Fig. 1
Comparison of surgical procedures showing greater percentage of Mako Partial Knees within 2° of planned target value.
FS= Femoral Sagittal FA= Femoral Axial TC*= Tibial Coronal
FC= Femoral Coronal TS= Tibial Sagittal TA=Tibial Axial * = non-significant parameter

Reference:
Bell SW; Anthony I; Jones B; MacLean A; Rowe P; Blyth M. Improved accuracy of component positioning with robotic-assisted unicompartmental knee arthroplasty: data from a prospective, randomized controlled study. J Bone and Joint Surg. 2016;98: 627-35.

MAKPKA-POS-20_19008