

# The Accuracy of Digital Templating in Primary Total Hip Arthroplasty

Stephen R. Kantor, MD and Ivan M. Tomek, MD  
 Department of Orthopaedic Surgery  
 Dartmouth-Hitchcock Medical Center and Dartmouth Medical School  
 Lebanon, NH, USA



## Introduction:

- Successful hip reconstruction is predicated upon the restoration of normal hip biomechanics and selection of implants of appropriate size and geometry to avoid intraoperative and/or postoperative complications. This may aid to ensure long-lasting function and pain-relief.
- Digital preoperative planning enables the surgeon to select from a library of templates and electronically overlay them on a magnification-calibrated image, thus performing a 'dry-run' of the procedure prior to proceeding to the operative suite.
- The transition from traditional film radiographs to digital images has necessitated a change in the way surgeons preoperatively prepare for arthroplasty surgery.

## Purpose:

The purpose of this study was to assess the ability of digital templating software to accurately predict implant size requirements for primary total hip arthroplasty.

## Methods:

- 135\* consecutive primary total hip arthroplasties were templated preoperatively using the TraumaCad™ templating software (Orthocrat Ltd, Israel).
- Hips were templated using magnification-calibrated radiographs. For each hip, an AP pelvis, AP and false profile projection were used for the preoperative assessment.
- All acetabuli implanted were either Trilogy Trabecular Metal (Zimmer), Trident PSL (Stryker), or Pinnacle (DePuy) implants.
- Femoral stems were either Alloclassic or ML-Taper (Zimmer), Accolade or Exeter (Stryker), or Corail (DePuy).
- All hips were implanted by a single surgeon using either a MIS posterior or modified MIS Watson-Jones approach.
- Postoperatively, the predicted implant size was compared to the actual components selected at the time of surgery.



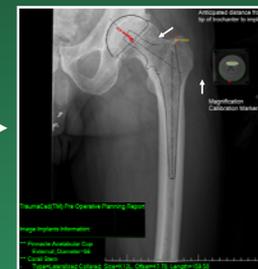
Preoperative templating process begins with acquisition of AP and False Profile projections with magnification markers (of known size) at the level of the bone of interest.



False Profile image is imported into the templating application and calibrated using the marker. Sizing of the acetabulum by digital template overlays of proposed acetabular component.



Selected acetabular component depicted on AP projection. Femoral component is then selected based upon size, offset and desired correction of leg-lengths.

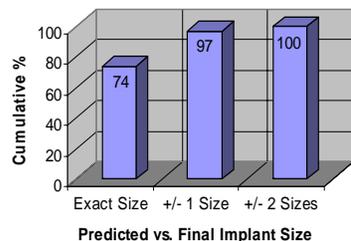


Final preoperative template with the list of anticipated implants and sizes taken with to the operative suite.

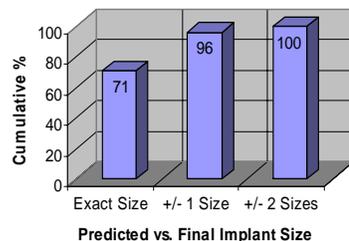


Postoperative radiograph depicting actual reconstruction. Intraoperative implant selection positioning match anticipated preoperative plan.

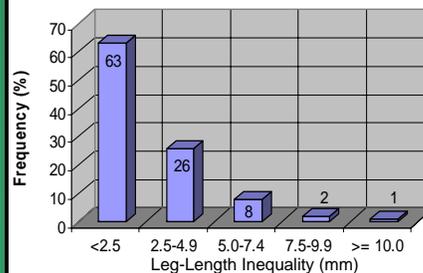
## Ability to Predict Acetabular Component



## Ability to Predict Femoral Component



## Postoperative X-Ray Leg-Length Inequality



## Conclusions:

- Surgeon's ability to anticipate intraoperative needs is critical to success.
- Digital X-Ray imaging has necessitated a change in the way preoperative templating is performed.
- Digital preoperative templating for hip arthroplasty enables this need.
- The TraumaCad™ application proved highly accurate and reliable, predicting exact component size in >70% of cases, within 1 size in >95% of cases, and within 2 sizes in 100% of cases.
- Intraoperative restoration of leg-lengths was highly reproducible and accurate, achieving a postoperative difference less than 5 mm in 89% of cases.
- This accuracy transcended the multiple implant designs employed.
- It is likely that this technology (using magnification-calibrated images) enables more precise prediction of intraoperative needs when compared to the traditional film-based techniques (that relied upon estimations of magnification).
- To our knowledge, this is the largest series of digitally-templated hip arthroplasties reported.

\* Please note: Patient cohort / data updated since submission of original abstract

