Accuracy Of Digital Templating In Total Knee Arthroplasty And The Impact Of Level Of Training On Templating Precision

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Introduction

Digital templating for Total Knee Arthroplasty (TKA) is a beneficial tool in preoperative planning as it allows the selection of types and sizes of implants, providing an opportunity to decide on alignment, position and orientation of the components and may also play a role in predicting intraoperative difficulties. Whilst templating is routinely used, its precision and accuracy in TKA is still debated. Factors including the standardisation and magnification of radiographs, and the level of training of the person performing templating can affect the accuracy.

Aims

The aim was to determine the accuracy of preoperative digital templating for TKA at our institution by comparing the templated implant sizes with the actual size of prosthesis used. The secondary aim was to identify how the level of training of the person performing the templating affected the accuracy and precision of the templates.

Methods

We used the electronic record system to identify patients who underwent TKA between September 2019 and September 2020. TraumaCad was used for digital templating and the templates were directly stored on the Picture Archiving and Communication System (PACS). From PACS we obtained the pre- and post-operative x-rays, the templated implant sizes and the author of the templates thus identifying their level of training (consultant, fellow and generic log in used by visiting consultants and their registrars). We reviewed the operation notes to identify the actual sizes of prostheses implanted.

Results

A total of 90 patients with TKA were identified with an average age of 71 years (51-86). Overall, the actual femoral component was either the same size as templated or within one size in 76 cases (84.4%), while the actual tibial component was either the same size as templated or within one size in 72 cases (83.8%) (Table 1). Across the three categories of level of experience the femoral component was templated the same as the actual prosthesis in 9 cases (42.9%) by Consultants, 9 cases (45%) by Fellows and in 22 cases (44.9%) by the Generic group. The femoral component was templated within one size difference from the actual implant in 6 cases (28.6%) by Consultants, 6 cases (30.0%) by Fellows and in 24 cases (49%) by the Generic group. There was no statistically significant difference across the three categories (p=0.471). The tibial component was templated the same size as the actual implant in 27 cases (55.1%) in the Generic group, but in only 6 cases (28.6%) by Consultants and 4 cases (20.0%) by Fellows. The actual tibial component size used was within one size difference from the template in 10 cases (47.6%) by Consultants, 10 cases by Fellows (50%) and 18 cases (36.7%) by the Generic group. Once again, there were no statistically significant differences in tibial component sizing between the three groups (p=0.802).

	Total	Consultant	Fellow	Generic log in
Number of cases	90	21	20	49
Femoral component same size	40 (44.4%)	9 (42.9%)	9 (45.0%)	22 (44.9%)
Femoral component 0.5 size difference	6 (6.7%)	-	-	6 (12.2%)
Femoral component 1 size difference	30 (33.3%)	6 (28.6%)	6 (30.0%)	18 (36.7%)
Femoral component 2 sizes difference	10 (11.1%)	5 (23.8%)	3 (15.0%)	2 (4.1 %)
Templated femoral component	5	6	5	4
Actual femoral component	5	6	5.5	5
R value	0.6445	0.7502	0.1288	0.7792
Tibial component same size	37 (41.1%)	6 (28.6%)	4 (20.0%)	27 (55.1%)
Tibial component 0.5 size difference	5 (5.6%)	-	-	5 (10.2%)
Tibial component 1 size difference	33 (36.7%)	10 (47.6%)	10 (50.0%)	13 (26.5%)
Tibial component 2 sizes difference	11 (12.2%)	4 (19.0%)	5 (25.0%)	2 (4.1%)
Templated tibial component	4	6	5	4
Actual tibial component	4	5	5	4
R value	0.6554	0.7755	0.3051	0.7286

Table 1. Breakdown of templated implant components and their size difference compared to actual implant used

Conclusions

The results identified that knee templating provided good accuracy in predicting component sizes. Although there were no statistically significant differences related to the level of training, the results suggested that the Consultant and Generic groups had higher accuracy and precision compared to Fellows, although further large scale studies would be required to fully evaluate this.

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