Comparison of accuracy in 2D and 3D templates in total knee arthroplasty

Tânia Viana[1,2,*], Brígida Mónica Faria[1,2]

1. ESS – Polytechnic of Porto, Porto, Portugal; 2. LIACC – Artificial Intelligence and Computer Science Lab (member of LASI), Porto, Portugal.

* Corresponding author email: taniaviana1998@gmail.com

Introduction: Total knee arthroplasty replaces damaged components with prostheses, often used to treat severe osteoarthritis or joint injuries. Advances such as digital templating improve preoperative planning, reducing errors and costs, but accuracy in the choice of implants is crucial to the success of the intervention. This study will compare the accuracy between three-dimensional (3D) and two-dimensional (2D) templating in total knee arthroplasty (TKA), highlighting the expected superiority of 3D templating in accuracy, despite higher costs, compared to 2D templating, which offers a more cost-effective, albeit less accurate, approach. Objectives: The aim of this study is to evaluate the accuracy of three-dimensional (3D) models compared to two-dimensional (2D) models in the context of total knee arthroplasty (TKA) surgery. **Objectives:** The aim of this study is to evaluate the accuracy of three-dimensional (3D) models compared to two-dimensional (2D) models in the context of total knee arthroplasty (TKA) surgery. **Methods:** This study will be conducted using PeekMed software. Planning will be carried out by orthopedic physicians or accredited personnel in both dimensions. Statistical techniques will be applied to assess accuracy and correlation between clinical variables such as age, gender and height. Statistical analysis may require different approaches depending on the sample size and data distribution. For 2D data, it will be possible to apply parametric tests, such as Student's t-test or analysis of variance (ANOVA). Three-dimensional data may require non-parametric statistical methods, such as the Wilcoxon test or the Kruskal-Wallis test. **Results:** The study to be carried out aims to examine the results of total knee arthroplasty in a sample of 87 participants, 64 of whom are female and 23 male, aged between 47 and 85. It is to be expected that there will be a predominance of two-dimensional data compared to three-dimensional data. This scenario is influenced by factors such as the availability of resources, data collection methods and the complexity associated with generating three-dimensional models. **Conclusion:** The results obtained will be crucial to furthering understanding of the clinical and technical implications of these approaches, and can be presented at medical congresses to foster discussion and progress in orthopaedics. Three-dimensional (3D) models are expected to demonstrate superior accuracy in predicting the actual size of the implant in total knee arthroplasty (TKA) compared to two-dimensional (2D) models, helping to reduce intraoperative errors. Despite the costs associated with 3D models, their possible high accuracy makes them a valuable option for surgical planning of TKA, while 2D models offer a more economical but less accurate approach.

Keywords: Total knee arthroplasty, digital templating, precision.

References:

1. Ioshitake, B.C.A.F, Mendes, E.D, Rossi, F.M, Rodrigues, A.D.C. (2016). Reabilitação de pacientes submetidos à artroplastia total de joelho: revisão de literatura. Revista da faculdade de ciências médicas de Sorocaba v.18 (nº1)
2. Ettinger. M, Claassen, L, Paes, P, Calliess, T. (2016) 2D versus 3D templating in total knee arthroplasty, The Knee v.23 (nº1)

3. PeekMed Blog Orthopedics and heathcare technology (2021) PeekMed® Raises $3 Million in Series A round to continue its expansion