



## ORIGINAL ARTICLE

# Computer assisted surgery. Its usefulness in different levels of pre-operative deformities<sup>☆</sup>



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### KEYWORDS

Total knee replacement;  
Navigation;  
Computer assisted surgery;  
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### Abstract

**Objective:** To compare the results obtained with computer assisted surgery with conventional techniques and evaluate the influence of navigation at different levels of preoperative deformity.

**Materials and method:** A retrospective study was conducted on 100 cases with primary total knee arthroplasty performed with conventional or computer assisted surgery. A comparison was made of the post-operative mechanical axis of the lower limb between both groups and in terms of pre-operative deformity.

**Results:** Optimal alignment is most often obtained by using the navigation system (62%) than by a conventional technique (36%). Patients with deformities under 10° varus showed a mean post-operative alignment within the optimal range ( $0 \pm 3^\circ$  deviation from the neutral mechanical axis), while those with more than 15° of varus show an alignment out of range, regardless of the technique used ( $p = .002$ ). In those with a deformity of between 10° and 15° of pre-operative varus alignment, values were found closer to the neutral axis in the navigation group (178.7°) than in the conventional technique (175.5°), although these differences are not statistically significant ( $p = .127$ ).

**Conclusion:** Post-operative alignment obtained with navigation is better than with the conventional technique, with a smaller percentage of cases out of range, and greater accuracy in placing implants. A potential benefit was observed in navigation for cases with deformities of between 10° and 15° of varus.

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**PALABRAS CLAVE**

Artroplastia total de rodilla;  
Navegación;  
Cirugía asistida por ordenador;  
Alineación postoperatoria

**Cirugía asistida por ordenador. Su utilidad en distintos grados de deformidades preoperatorias****Resumen**

**Objetivo:** Conocer los resultados obtenidos con cirugía asistida por ordenador en nuestro medio en comparación con las técnicas convencionales y analizar la influencia de la navegación ante distintos grados de deformidad preoperatoria.

**Material y método:** Estudio retrospectivo con 100 pacientes intervenidos de artroplastia total de rodilla mediante técnica convencional y cirugía asistida por ordenador. Se comparó el eje mecánico postoperatorio del miembro inferior en carga entre ambos grupos y en función de la deformidad preoperatoria de cada caso.

**Resultados:** Se obtiene una alineación óptima con mayor frecuencia al utilizar el sistema de navegación (62%) que mediante una técnica convencional (36%). Los pacientes con deformidades menores de 10° de varo presentaron una media de alineación postoperatoria dentro del intervalo óptimo ( $0 \pm 3^\circ$  de desviación del eje mecánico neutro) mientras que aquellos con más de 15° de varo muestran una alineación fuera de rango, independientemente de la técnica empleada ( $p=0,002$ ). En aquellos con una deformidad de entre 10 y 15° de varo preoperatoria los valores de alineación se encontraron más próximos al eje neutro en el grupo de la navegación (178,7°) que en el de técnica convencional (175,5°), aunque estas diferencias no son estadísticamente significativas ( $p=0,127$ ).

**Conclusión:** La alineación postoperatoria obtenida con la navegación es mejor que con la técnica convencional, con un menor porcentaje de casos fuera de rango y una mayor precisión en la colocación de los implantes. Se observa un potencial beneficio de la navegación para aquellos casos con deformidades de entre 10 y 15° de varo.

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**Introduction**

Postoperative alignment of the lower limb is a factor with a considerable relevance in determining long-term survival of a total knee arthroplasty. A wrong positioning of the components conditions an asymmetric load distribution, giving rise to an increase in the risk of aseptic loosening, instability and pain.<sup>1</sup> In this regard, computer-assisted surgery (CAS) systems have been developed with the aim of providing greater precision to this procedure and reducing the percentage of cases with malalignment, which should translate into a decrease of the failure rates, along with an increase in implant survival. In addition, CAS offers intraoperative information in real time about the condition of the ligaments and the kinematic arch of the knee.<sup>2</sup> Numerous works have been published so far comparing the results obtained with conventional instrumentation techniques versus those obtained through the use of surgical navigation techniques, mainly regarding postoperative alignment and, more recently, on clinical and functional parameters. The results achieved show considerable variability, ranging from those favorable to navigation<sup>3-15</sup> to others which found no differences between both methods,<sup>16-24</sup> so this is a controversial topic. Some authors have also argued in favor of the potential benefit that these systems could offer in cases with significant intra- and extraarticular deformities, in which restoring a neutral postoperative alignment correctly is much more complex.<sup>13</sup> However, the degree of deformity at which the use of these systems would offer an advantage over conventional instrumentation has not been established.

The objective of this work is to establish the clinical and functional results, as well as those obtained in terms of radiographic alignment in the coronal plane, obtained with CAS in our medium compared to conventional techniques and to analyze the influence of navigation in different levels of preoperative frontal deformity.

**Materials and methods**

We conducted a retrospective cohort study with 100 patients who suffered knee arthrosis and underwent primary total knee arthroplasty at our center between June 2009 and March 2011. Out of this total, 50 had been operated using a conventional technique and the other 50 with the aid of computer-assisted navigation systems. The sample size for a cohort study was calculated based on the results of the most recent metaanalysis,<sup>25</sup> according to which 13% of the navigation prostheses were outside the desired interval of  $\pm 3^\circ$  of the mechanical axis. Based on a relative risk of detection of 0.35, with an  $\alpha$  error of 0.5 and  $\beta$  of 0.8, we established a minimum sample size of 100 cases (50 in each group, upon establishing a ratio of 1 exposed/not exposed). This calculation was conducted with the software package Epidat version 4.0. Case selection was carried out by reviewing, consecutively and following a chronological order, all those patients intervened for total knee arthroplasty in the given period. We included patients operated for primary total knee prosthesis with a Genesis II model (Smith & Nephew®, Memphis, Tennessee, USA) – both the design with conservation of the posterior cruciate ligament

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