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Infographic: Three key elements of kinematic alignment total knee arthroplasty for clarified understanding of its approaches

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Kinematic alignment total knee arthroplasty (KA-TKA) was advocated by Howell et al,¹ and with growing interest there have been increasing reports on various approaches to it. Such enthusiasm, however, has also led to confusion. In order to better understand KA-TKA and its derivatives, clarification may be provided by consideration of three key knee elements: morphology, soft-tissue, and alignment. Each element determines and is determined by the others, maintaining the best harmony of the elements to construct the best unique kinematics on an individual basis. Differing from the original concept of kinematic alignment, which is alignment that follows the three kinematic axes (cylindrical, patellar, and tibial rotation),² recent KA-TKA instead aims to recreate the patient's original kinematics by setting the harmony of these components in a bespoke alignment.

The three elements of harmony can be the starting points of a KA-TKA approach. Calipered or true KA-TKA starts from the morphology, aiming to mimic the original articular surface (or joint line) by bone resections with compensation for cartilage defects.^{2,3} The soft-tissue-based KA-TKA originates from the idea of balancing the soft-tissue, and the tibial cutting surface is made parallel to the femoral resection surface under appropriate in-line tension based on this balance.^{4,5} These two approaches are categorized as unrestricted KA-TKA. Restricted KA-TKA, meanwhile, commences with alignment evaluation and control. The bone is cut parallel to the joint line within a safe range; the cut is otherwise made in the defined alignment.^{6,7} Intraoperative adjustment of KA-TKA, such as functional alignment and robot-assisted KA-TKA, decides the bone cut plane based on pre- and intraoperative measurements of the three elements to replicate the harmony using computer-aided devices,^{8,9}

although intraoperative adjustment protocols are provided in other approaches.³ The question of how to adjust the component alignment and soft-tissue balance is crucial; therefore, they should be clearly defined in each approach.¹⁰ The starting points and adjustment protocols concerning the other elements may differ, but all approaches aim to achieve the same goal: patient-specific kinematics with individual harmony of alignment, soft-tissue, and morphology. The term 'kinematic' suggests that kinematics are the goal of KA, irrespective of the approach used, while 'alignment' suggests involvement of component alignment to fulfil the harmony.

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Three knee elements

Each element determines and is determined by the other two elements

