Commentary

Effect of age on cost-effectiveness of unicompartimental knee arthroplasty compared with total knee arthroplasty in the US

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Originally conceived as a treatment for joint disease in the elderly, joint replacement surgery grew substantially during 1990s and 2000s in both the elderly and the younger patient population, with an increasing utilization expected to exceed one million annually by 2020 (1).

Arthroplasties are major orthopaedic procedures that are reliable and cost-effective and deliver excellent long clinical and patient-reported outcomes (2,3) with extensive medical and non-medical benefits for patients and society. In fact, working-age individuals may gain a higher likelihood of employment and a higher mean annual income with fewer missed work days (4).

Because of the success of these procedures in treating end-stage joint arthritis, they are being increasingly offered to younger, more active patients, as well as to those who have a higher body mass index (1). The expected rise in demand for these procedures, together with the economic down turn, raise questions about the sustainability of growth for joint replacement in the future, and put pressure for proper treatment indications. In this light, the debate on total knee arthroplasty (TKA) *vs*. unicompartmental knee arthroplasty (UKA) is currently a controversial topic, with the literature divided between findings of no difference or advantage for UKA (5,6).

TKA presents a solid literature which shows reliable results and an excellent relief of pain and restoration of knee function also in an octogenarian population (7). On the other hand, UKA continues to gain popularity as a viable treatment option for osteoarthritis or osteonecrosis isolated to one compartment of the knee, because of the potentially well-known advantages over TKA because it involves a less aggressive surgical procedure (8,9). These advantages include preservation of bone stock and cruciate ligaments, early and complete knee range of motion, faster recovery, and reduced complications (10). In addition, the risks of intra and postoperative bleeding, venous thrombosis, infection rates, costs, and development of medical complications are increased with TKA compared with UKA (10). Nonetheless, due to the higher risks of revision, UKA remains a controversial procedure, with trade-offs between upfront benefits and later risk of revision still poorly understood.

Ghomrawi *et al*. (11) performed an extensive analysis, comparing UKA *vs*. TKA in order to assess cost-effectiveness across the entire age spectrum of patients candidate to joint replacement. Interestingly, results were documented to be age dependant. UKA has important economic implications with substantial lifetime savings, in large part attributed to lower rehabilitation costs, in patients 65 and older. On the other hand, their results favour TKA in younger patients. Nonetheless, the authors also underlined key factors that may change lifetime costs and therefore treatment indications. In fact, in a simulated threshold analysis with reduced rehabilitation costs, UKA may become no longer cost-effective. However, regardless of economic considerations, benefits of UKA may appeal to younger patients who are still active and in the work-force, feeling that the immediate quality-of life benefits may outweigh the increased risk of revision at a later less active age.

A proper understanding of advantages and disadvantages of the different treatment indications requires the awareness of an evolving scenario. Newer surgical techniques for UKA may allow to preserve more soft tissues and ligaments, thus resulting in more normal knee kinematics, and also to minimize bone resection, thus avoiding the need for metal augments and/or stemmed components instead of standard implants in case of revision (12). Moreover, beside a simplified revision procedure, the failure rate itself may be

drastically reduced, thus making UKA cost-effective even in younger patients (11). To this regard, Liddle *et al.* (13) showed how the rate of revision of UKA is highest with low usage surgeons, while large UKA practices have the lowest rates of revision. Procedures performed in high volume centers may therefore reduce the drawbacks of this minimally invasive surgery, as confirmed by Pandit *et al.* in a prospective study on 1,000 UKA, which documented a 99% survival of the implant at 15-year (14).

A significant percentage of failures is actually related to technical aspects (15,16), whose recognition may allow to solve the argument between unicompartmental and total knee implants by minimizing the risk of revision after UKA. Thus, while currently the debate is influenced by the available literature based on heterogeneous series showing high failure rates, future studies on surgeries performed in highly specialized centers may allow proving both the better short-term outcomes and the long-term cost-effectiveness of UKA for a society with an increasing demand for prosthetic replacement.

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Footnote

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