Editorial

Simultaneous Versus Staged Total Knee Arthroplasty (TKA)

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There has been significant on-going debate on doing bilateral TKA either under a single anesthesia or staging the surgery (replacement on the contralateral knee within maximum of one year following the first knee) [1]. There are proponents of both techniques.
{The term staggered TKA refers to replacement on the same period of hospitalization, but not on a single anesthesia [2] and there is not much literature support for that).
Around 30% of patients who undergo unilateral TKA have enough symptoms -both in terms of pain and functional impairments, to require contralateral replacement within 10 years [3].
The controversy of simultaneous versus staged bilateral TKA can be looked at in 4 different categories:

1. Which technique would be more economic and what is the cost-effectiveness?
2. Functional achievements: which one has better functional outcome?
3. Complications, morbidity and mortality rate: which one is safer?
4. What percentage of patients and for how long after first TKA, would not need contralateral TKA?

A: Economic issues

The detailed cost evaluation research on 24020 cases of simultaneous bilateral TKA and 881002 cases of one-side TKA from 2013, reported the expenses of $43401 for simultaneous and $72253 for staged TKA.
The authors had used a sophisticated "incremental cost-effectiveness ratio" and concluded that simultaneous TKA was cheaper [4].
Shorter operating time and period of hospitalization was noted for simultaneous bilateral TKA in the systematic review by Wang K. et al.[3] and suggested that younger age, work status and home support as important considerations for bilateral, same anesthesia knee replacement[5].

B: Complications

Complications of Staged or simultaneous bilateral TKA have been compared in several research. Adjusted risk of pulmonary embolism have been 80% higher in 3-months period after simultaneous bilateral than staged TKA-. But the sum of risk associated with 2 operations of staged surgery may be equal or exceed the risk of simultaneous TKA. Barrett et.al. on their 2006 report on 122385 Medicare patients' chart review recognised a pulmonary embolism rate, in first 3-months post TKA, of 1.44% in simultaneous and 0.81%in those who had single knee replacement. Higher cardiovascular complication within 30days in simultaneous TKA has been also stated in other reports, but with a reduced periprosthetic joint infection (PJI) rate [6]. Those authors had recommended simultaneous bilateral TKA only for those with no risk of cardiovascular side-effects [5].
Waren J et al.in their 2020 article compared this issue in 4 risk levels of health in a large national cohort of >320,000 patients and suggested that bilateral simultaneous TKA may not be safe even in a healthy patient when compared with unilateral TKA, since over 3-folds increase in overall complication was encountered in least healthy and also healthiest cases with the simultaneous TKA [6,7].
Jared A. also confirms Waren 's views and cautions about surgeons' misconception and bias at looking at his own individual patient, forced by patient's desire making them to advocate bilateral TKA[8].
Higher mortality rate of 17% in unilateral TKA versus 0.49% in simultaneous bilateral TKA has been, however, reported by Parvizi, et al. [9]. It is noticeable that the use of navigation system seems to decrease the early mortality rate as stated by Kirvan, et.al.[10].
Wang.et al. in a systematic review in 2023 found that if staged TKA is planned, one should wait at least 3 months before embarking on the contralateral knee[7]. Makaram et.al. had similar views of increase mortality with simultaneous bilateral knee replacement [11].

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C: Functional achievement

The quality of life-years obtained were 9.31 for simultaneous bilateral and 9.29 for staged TKA[4] .The rate of joint stiffness and need for manipulation under anesthesia has been reported to be less for simultaneous bilateral TKA compared with staged TKA . Simultaneous bilateral total knee arthroplasty is associated with shorter length of stay but increased mortality compared with staged bilateral total knee arthroplasty according to a systematic review and meta-analysis[6,12-17].

The theoretical merits of doing bilateral simultaneous TKA under a single anesthetic time are cited as shorter hospital stay, faster rehabilitation, and shorter period away from work. A non-operated painful arthritic knee on one side may be a factor for poor rehabilitation and resultant stiffness of the contralateral knee which has recently received arthroplasty -according to Mehan et al.[6] It has been suggested by Wang et.al. that the more severely involved knee usually receives TKA first and would be faced with more stiffness incidence, requiring manipulation under anesthesia, which would be a selection bias, and does not support the issue of simultaneous bilateral surgery[3,15]. Comparable results in simultaneous and staged TKA have been reported when functional scorings of WOMAC, Oxford, Knee Society scores, and 10-year survival analysis criteria have been used. Based on a recent "World Expert Meeting" the bilateral TKA under single anesthesia is not recommended for older age candidates, severely obese, and when major medical comorbidities, like chronic renal, cardiac and pulmonary exist and are not well controlled[16-18].

D: When does the second knee need replacement?

The issue that has not been well documented or analyzed in literature is how long after the first TKA, one would require the contralateral side to be replaced. There are infrequent occasions of significant improvement of function and pain symptoms on the contralateral, less arthritic knee after the first TKA that the patient does not want or need to undergo the second knee replacement.

In summary

Simultaneous Bilateral TKA is probably cheaper for the patient and insurance companies; can, however, be associated with more complications and possibly mortality ,especially in older patients with compromised cardiopulmonary status. The functional improvement and gains of simultaneous versus staged (done within one year after the first) TKA are comparable. Decision on choosing one versus another should be individualized. The surgeon needs to consider, not only his/her own time and endurance, but also the availability of the needed systems in the facility he/she will be doing the simultaneous surgery. And only then, may offer simultaneous bilateral TKA to a relatively healthier candidate who has enough clinical and radiographic disability ,that would most likely bring him to surgery for opposite knee within one year from the first TKA . Bilateral simultaneous TKA is not recommended for patients with significant cardiopulmonary and renal insufficiencies.

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