

Patient's Perception in Bicruciate-Retaining Total Knee Arthroplasty



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Abbreviations: TKA: Total Knee Arthroplasty; ACL: Anterior Cruciate Ligament; ADL: Activity Of Daily Living; ROM: Range of Motion; PROM: Patient-Reported Outcome Measurements; FJS: Forgotten Joint Score

Introduction

In treatment of advanced osteoarthritis, total knee arthroplasty (TKA) with the sacrifice of the anterior cruciate ligament (ACL) is the standard treatment. There is high proportion of patients who report residual knee symptoms after TKA without any identifiable objective clinical or radiological reasons. In regards to cruciate-retaining knee arthroplasty in the last decade, knee surgeons have mainly focused on the posterior cruciate ligament [1-4]. However, anatomic studies have shown cruciate ligaments; especially anterior cruciate ligament contains a considerable number of proprioceptive nerve cells. Sacrifice of the ACL can also be accompanied with abnormal kinematics resulting in functional limitations and a reduced balance [3,4]. Reduced balance capacity can cause various problems in activity of daily living (ADL). Balance problems due to limitations in proprioception after TKA can cause frequent falls. Besides this, reduced balance after the arthroplasty can lead to a situation where patient senses the joint as a foreign body which can be associated with non-specific pain and can cause functional deficit [1,4-6]. First generation bicruciate-retaining total knee arthroplasty (BCR-TKA) was developed in the 1960s which aimed for a natural knee joint movement. Bicruciate-retaining implants have shown a more physiologic anterior femoro-tibial contact point and a greater posterior translation in motion compared to ACL-sacrificing implants Cloutier et al.[1,3,6-10].

Reported excellent clinical results for the first generation of BCR-TKA with a survivorship rate of 95% after ten years and 82% after 22 years. However 38% of patients had limited range of motion (ROM) and pain. Despite technical advances, many patients

have reduced ROM compared to standard TKA [11]. This problem is especially common in patients who have limited preoperative ROM [12]. Initial results of BCR-TKA have shown that these implants are associated with a higher "overall satisfaction" [13]. However, the question remains if this improvement is due to retention of ACL. Proprioception is the ability to sense the relative position and movement of neighboring anatomic structures. Schwartz et al have found balance ability an important factor for quality of life after TKA [14]. Therefore, the question is whether the bicruciate-retaining implant can provide superior balance ability and improved quality of life. In a recent prospective cohort study, we found that bicruciate-retaining implants can provide a superior level of proprioception compared to standard cruciate-sacrificing implants [11].

Besides proprioceptive abilities, the patient's sensation of the artificial joint is crucial for the patient's perception. Prior studies on patient satisfaction after TKA have used conventional clinical scores (e.g. Knee Society Score [15]). Conventional scores have impairments in discrimination of good and very good results. This makes it difficult to reveal minor differences in TKA. However, recent studies have shown that BCR-TKA is perceived as "overall better" compared to a cruciate sacrificing TKA [6,13,16]. Patient-reported outcome measurements (PROM) have become an important tool to evaluate activities, limitations in everyday life and quality of life. Several scores have proven their validity to discriminate patients with a good or excellent outcome from patients with a poor outcome very well. The Forgotten Joint Score (FJS) is a relatively new PROM tool paying special attention on the patient's ability to forget the

artificial joint in everyday life. Accordingly, the loss of awareness of the artificial knee joint is seen as the ultimate goal resulting in maximum patient satisfaction. Recently published data on PROM of patients after BCR-TKA confirmed a reduced joint awareness for BCR-TKA compared to a standard total knee arthroplasty [16].

The FJS score values of the BCR-group were equal to the unicondylar knee arthroplasty patients. These results support the assumption that a bicruciate-retaining knee arthroplasty provides a superior patient perception. Nevertheless, implantation of a BCR-TKA is a technically demanding procedure. There are reports of a long learning curve even for experienced knee surgeons [17]. There are also reports on intraoperative island fractures due to a narrow bony base of the ACL and postoperative cyclops syndromes [12,18,19]. Development of these implants is associated with additional costs. The question is whether companies are willing to take the risks of development costs given that the product currently has a limited target group of patients.

Conclusion

BCR-TKA is technical advancement for patients with knee OA showing early promising results regarding postoperative function and patient satisfaction. However, these results are related to some basic requirements like patient selection and the surgeon’s experience with the implant. Further prospective randomized trials are necessary to investigate long-term survivorship and limitations in early postoperative range of motion of some patients.

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