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CORR Insights

CORR Insights®: Does Tourniquet Use in TKA Affect Recovery of Lower Extremity Strength and Function? A Randomized Trial

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Where Are We Now?

Tourniquet use during TKA [1] offers better visibility, decreases intraoperative bleeding, and helps in cement-bone interdigitation during surgery [4, 10]. Despite these benefits, the development of thromboembolic events like deep venous thrombosis [2, 13], pulmonary embolism [5], or multiple cerebral and cardiac microemboli [8, 9] all remain a concern when considering tourniquet use. Other complications include increased leg swelling and pain after release [11, 12], tourniquet-induced wound problems [7], peripheral nerve injury [6], or decreased knee ROM [3]. Although there are ongoing debates regarding the pros and cons of tourniquet use, no sufficient investigations have been made on its possible negative effect on the recovery of lower extremity strength and function, which are vital to postsurgical recovery.

The current study by Dennis and colleagues adds to our understanding by finding greater postoperative quadriceps strength and lesser pain for patients in the nontourniquet cohort. In contrast, researchers found no differences in hamstring strength, quadriceps voluntary activation, or unilateral balance ability in patients who underwent bilateral simultaneous TKA. Additionally, the study results found more intraoperative blood loss in the nontourniquet group, but no differences in total blood loss or operative time when compared to the group undergoing same-day bilateral TKA.

Where Do We Need To Go?

The study design (double-blind randomized controlled study) by Dennis and colleagues increased the level of evidence to support "limited or no use of tourniquet during the primary TKA." However, more investigation and quantitative information regarding the relationship between tourniquet time and quadriceps strength is needed. A minimum or average duration of tourniquet use should be investigated in order to determine the cause of quadriceps or hamstring weakness. Researchers should also consider investigating the length of time patients will experience tourniquet-induced muscle weakness as well as its

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effect on intraoperative and perioperative blood loss. Measuring intraoperative and perioperative blood loss remains challenging, because there are no objective methods to calculate blood loss accurately. When we get some of these questions answered, we may be able to arrive at some practical guidelines pertaining to tourniquet use; any such guideline should consider issues related to bilateral surgery (unilateral, simultaneous bilateral, or staged bilateral), safe durations, and absolute/relative indications and contraindications.

How Do We Get There?

Future studies must employ a more quantitative approach, and, wherever possible, robust experimental designs (including proper randomization). Studies of function should be large enough to evaluate recovery of lower extremity strength and function as a function of varying tourniquet time (or at least to distinguish among no tourniquet use, limited use, half-course use, and full-course use). In addition, longer-term followup is needed to determine the duration of tourniquet-related complications.

In order to evaluate blood loss, more accurate and objective methods are needed. Our current estimations are based on blood on the sponges, swabs, suction drainage, and wound drainage; these approaches suffer from considerable interrater variability. Intraoperatively, a standardized protocol for measuring blood loss is needed. Diluted blood collected in the suction bottle during the surgery should be counted and compared with the amount of irrigation saline used. Additionally, an intravascular blood volume state should be maintained as equal as possible throughout the surgery to minimize the order effect. A considerable amount of blood loss from the leg operated on first may affect the blood loss from the other leg, which would be operated on next. Postoperatively, identical wound drainage should be used with similar removal time. Hemarthrosis should be taken into account after the removal of any potential drainage.

In order to move towards the goal of an evidence-based guideline or algorithm for tourniquet use, we would first need a comprehensive systematic review or meta-analysis of all relevant, well-designed studies. Currently, our pool of such studies is too small, too varied in quality, and insufficiently representative of the ways that tourniquets are used in practice (as noted, approaches like no tourniquet, use for a portion of the procedure, and use for the full duration of the procedure, should be considered). The study by Dennis and colleagues, which includes a number of important functional endpoints, is a good step in the direction of what we need. More studies—enough to populate a proper meta-analysis, so that we can derive some evidence-based practice guidelines—should follow behind this one.

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