TKA Sans Tourniquet: Let It Bleed: Opposes

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abstract

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The literature supports the routine use of a tourniquet during total knee arthroplasty (TKA). With tourniquet use, there is decreased intraoperative blood loss with subsequent improved visibility and a bloodless surgical field. This facilitates efficiency with the potential for decreased operating time. Increased operating time has been associated with an increase in the incidence of infection after TKA.

Opponents of routine tourniquet use cite rare or theoretical concerns. Multiple authors have concluded that the incidence of deep vein thrombosis is not related to using a tourniquet. The rare events of muscle dysfunction or nerve injury are transient. Peripheral vascular disease, in which patients have no palpable distal pulses, should be considered a possible contraindication to the use of a tourniquet during TKA. If tourniquet time and pressure are respected during TKA, we believe the benefits outweigh the perceived and theoretical concerns.

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The word *sans* is French, meaning “without.” There will always be stalwarts who continue to oppose using a tourniquet during total knee arthroplasty (TKA), without whom there would be no debate.

**Benefits of Tourniquet Use**

The facts speak for themselves. Routine tourniquet use potentially means a decrease in operating time, a decrease in intraoperative blood loss, dry bone surfaces for cement fixation, and a technically easier procedure with a bloodless surgical field.

Several studies have documented operating time and tourniquet use during TKA. Yavarikia et al reported a significant decrease in operating time when a tourniquet was used. Other authors have not confirmed this. They found that there was no significant difference in the operating time with or without a tourniquet. There was no consensus on when to deflate the tourniquet. The literature would suggest this alone affects both operating time and blood loss. A meta-analysis including 893 TKAs has shown that deflating the tourniquet before closure of the wound significantly increased total blood loss, volume of blood transfused, and operating time. A plausible explanation is reactive hyperemia associated with using a tourniquet. While deflating the tourniquet before closure of the wound allows visualization of sources of bleeding, deflating the tourniquet after wound closure can cause a pressure effect and control bleeding. Willis-Owen et al reported that the incidence of infection after 5277 total hip arthroplasties and TKAs was significantly increased with longer operating times. Therefore, if surgical time is ultimately reduced with the use of a tourniquet, this has the potential to reduce surgical site infections.

Proponents of using a tourniquet believe there is a decrease in intraoperative blood loss, and this improves visibility with a bloodless surgical field. In a meta-analysis of 1040 TKAs, there was a significant increase in intraoperative blood loss in the group that did not use a tourniquet. There was no significant difference in total blood loss or transfusion rate whether a tourniquet was used. It appears there will be similar total blood loss when one includes both intraoperative and postoperative losses. Therefore, do you want the blood loss intraoperatively or postoperatively? Wakankar et al called the bleeding a “nuisance,” and this would reflect our experience.

With an increase in intraoperative bleeding, it is more difficult to achieve a dry bone surface for cement fixation. It is unknown at present if this could potentially lead to increased component loosening over time. This would not be a concern with cementless fixation, but at present the vast majority of TKAs performed globally are cemented, not cementless.

**Theoretical Concerns of Tourniquet Use**

Controversy exists about the effect of a tourniquet on deep vein thrombosis (DVT) during TKA. One randomized controlled trial compared the incidence of DVT with or without a tourniquet. Patients received the same anesthetic and DVT prophylaxis. Ultrasound was used to diagnose DVT both pre- and postoperatively, and there was no significant difference between the 2 groups. Other authors have also concluded that the incidence of DVT is not related to using a tourniquet. To our knowledge there is only 1 study, that of Abdel-Salam and Eyres, that contradicts these findings; however, it is unclear what method was used to diagnose DVT in that series.

Delay in wound healing has been reported in up to 22% of cases after TKA. Clarke et al reported in a randomized controlled trial that although critical tissue hypoxia in the wound flaps was more likely when a tourniquet was used, it also occurred when a tourniquet was not used. Although there is no agreed-upon figure for optimal pressure, only inflating the tourniquet 125 mm Hg above the arterial blood pressure will minimize wound complications.

Studies have compared leg function after TKA with or without a tourniquet. There was a loss of knee flexion and straight-leg raise that was only significant during the early postoperative period after using a tourniquet. This may be related to pain, swelling, or axonal compression in the quadriceps muscle. The operations were all performed under general anesthesia. Silver et al found that an exsanguinated human limb will swell immediately by approximately 10% of its original volume after deflating the tourniquet. In a study by Saunders et al, fewer postoperative electromyographic changes of the quadriceps muscle were noted after knee arthroscopy when the tourniquet time was less. A biochemical study on canine hind limbs suggested that limiting the tourniquet time to 1.5 hours would avoid ischemic injury to the muscle. Tourniquet-induced nerve injuries during knee ligament surgery have also been described. Factors discussed that may lead to inadvertent extreme tourniquet pressure were the shape of the leg and calibration error.

One case report describes rhabdomyolysis associated with the use of a tourniquet during TKA. The tourniquet was inflated to 350 mm Hg for 92 minutes. The patient had hypertension; however, the arterial blood pressure was not documented. Two case reports describe cardiac arrest and acute pulmonary edema after deflating the tourniquet. Both are quoted in the literature on TKA.

Vascular injury during TKA is rare. Rand reported 3 cases in 9022 patients all related to atherosclerotic disease and not intraoperative trauma. Peripheral vascular disease is the one condition that we agree is a contraindication to using a tourniquet.
CONCLUSION

The routine use of a tourniquet during TKA results in decreased intraoperative blood loss, improved visibility, a bloodless surgical field, and enhanced potential for cement fixation. If tourniquet time and pressure are respected during TKA, we believe the benefits outweigh the perceived and theoretical concerns.

REFERENCES