Total knee replacement (TKR) is associated with post-operative blood loss requiring blood transfusion in up to a third of patients.\(^1\,^2\) The reported blood loss ranges from 1450 ml to 1790 ml, leading to anaemia in many patients.\(^3\,^4\) Post-operative anaemia in more elderly patients has increased clinical importance due to the reduced haematopoietic reserve. Adverse effects of anaemia include need for transfusion, longer hospital stay and associated increased costs. With changing demographics worldwide, the demand for TKR is expected to increase exponentially.\(^5\) Topical application of tranexamic acid (TXA) provides a novel approach for reducing blood loss after TKR. It is cost-effective compared to pre-operative erythropoietin and autologous blood donation.\(^6\,^7\)

Several experimental studies have demonstrated the molecular basis for the function of TXA, which acts by binding to the lysine-binding sites of plasmin and plasminogen. Saturation of these sites displaces plasminogen from the fibrin surface thus inhibiting fibrinolysis.\(^8\) The use of TXA has been shown to be effective in reducing post-operative blood loss in cardiac,\(^9\) dental\(^10\) and spinal surgery.\(^11\) De Bonis et al\(^12\) compared the post-operative bleeding following topical application of TXA versus a placebo for cardiac bypass surgery. They demonstrated a 36% reduction in bleeding at three hours and a 25% reduction at 24 hours. Oral TXA mouthwash is routinely used following dental surgery to reduce the post-operative bleeding. They demonstrated a 36% reduction in bleeding at three hours and a 25% reduction at 24 hours. Oral TXA mouthwash is routinely used following dental surgery to reduce the post-operative bleeding. Tsutsumimoto et al\(^13\) studied the efficacy of TXA in reducing peri-operative blood loss following cervical laminoplasty. In the TXA group, post-operative blood loss during the first 16 hours was reduced by 37% compared with the control group. The total blood loss in the TXA group was significantly lower than that in the control group.\(^13\) Lin et al\(^14\) reported a significant reduction in blood loss and need for transfusion in patients undergoing minimally invasive TKR. Dhillon et al\(^15\) showed TXA to be effective in reducing post-operative blood loss and transfusion requirements in patients undergoing bilateral TKR.

Systemic administration carries the risk of thromboembolic events. Given intravenously, TXA is widely distributed throughout the extra and intracellular compartments.\(^16\) It has been shown to diffuse into the synovial membrane and synovial fluid and achieve the same concentration in the joint fluid as the serum. The half-life within the joint fluid is three hours.\(^17\) The mode of excretion is by glomerular filtration with 90% excretion at 24 hours.\(^16\) Topical application of TXA is a simple and inexpensive procedure with minimal systemic absorption. It is a cheaper alternative compared with fibrin sealants currently in use,\(^18\) which carry a risk of infective transmission as they are derived from human plasma.\(^19\)

We performed a randomised controlled trial of 99 patients who underwent TKR, comparing the local effects of TXA in reducing post-operative blood loss and reducing the need for post-operative transfusion. Three subgroups were formed with one group receiving a saline placebo, another group receiving 1.5 g TXA and the third subgroup receiving 3 g of TXA. After implantation of the cemented components, the study solution was applied to the joint surfaces for five minutes. Post-operatively patients were followed-up for blood loss and need for transfusion. All patients received thromboprophylaxis and post-operative Doppler analysis was performed to rule out thromboembolic events. Our results showed that the topical application of TXA reduced the post-operative blood loss by between 20% and 25% (300ml to 400 ml) compared with the placebo group. We found no difference in the rates of transfusion between 1.5 g and placebo subgroups. None of the patients in the 3 g TXA group required transfusion. Two patients (one in the placebo group and one in 1.5 g group) had symptomatic pulmonary emboli confirmed on spiral CT. Both had negative Doppler study and were discharged with warfarin for three months. Post-operative function and range of movement in the knee were not affected by topical application of TXA in our study.\(^20\)

In conclusion, topical application of tranexamic acid has been shown to reduce blood loss by up to 25% resulting in a 17% higher postoperative haemoglobin values. Further studies are needed to ensure that this simple and cost effective tool is safe for routine use with regards to thromboembolic complications.

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