

Is Topical Application of Epsilon-Aminocaproic Acid Effective in Reducing Blood-Loss in Total Knee Arthroplasty?

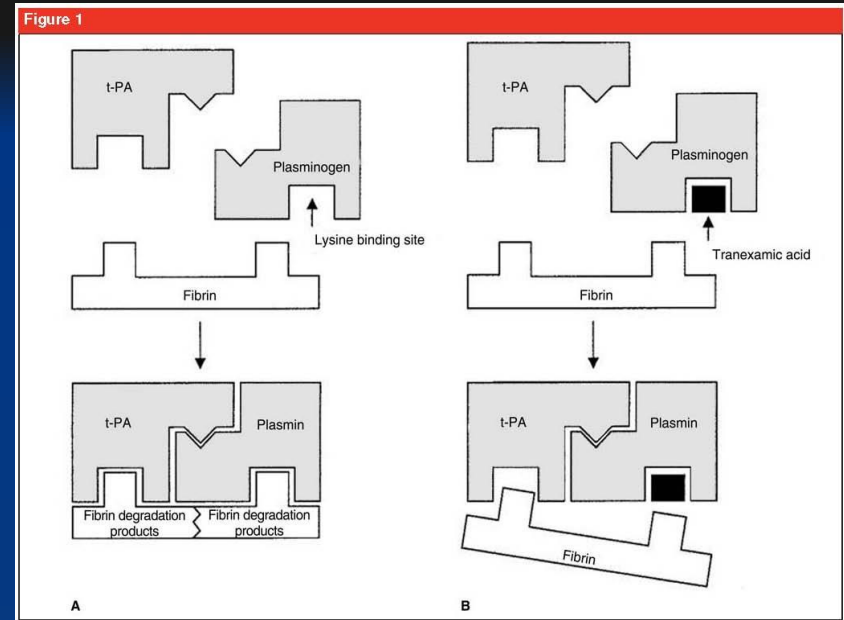
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Epsilon-Aminocaproic Acid (ϵ -ACA)

- Lysine analog
- Reversibly saturates the lysine binding sites on plasminogen
- Inhibits the binding of fibrin and the conversion to fibrin degradation products
- Prevents clot dissolution



Journal of the
American Academy of
Orthopaedic
Surgeons. 18(3):132-
138, March 2010.

Epsilon-Aminocaproic Acid (ϵ -ACA) reduces blood loss after joint replacement

- Several studies have demonstrated that ϵ -ACA reduces blood loss in TKA when given intravenously
- Previous work by the study group has shown that locally applied ϵ -ACA reduces blood loss after THA by 18%

Sucher, Giordani, Nedopil, Int. Ortho. 2016
Camarasa, Serra-Prat, Br J Anaesth. 2006
Churchill, Puca, Meyer et al. J Knee Surg 2016

Questions

- Is there a reduction in blood loss in patients treated with locally applied ϵ -ACA for TKA?
- Is local application of ϵ -ACA safe for use in TKA?
- Is there a reduction in treatment costs with local application of ϵ -ACA?

Methods and Materials

- Retrospective single surgeon, single center analysis of consecutive patients who underwent TKA from January 2012-August 2016

Methods and Materials

- Tourniquet was used for cementing and inflated after satisfactory alignment of components
- 5 g ϵ -ACA diluted in 100 ml normal saline soaked into the wound and secured with compression dressing, which was left in place for three minutes.
- No post operative drains were used

Methods and Materials

- 80 patients: no ϵ -ACA was applied to the wound
- 80 patients: 5 g ϵ -ACA was applied before the release of the tourniquet
- 80 patients: 5 g ϵ -ACA applied after the tourniquet was released

Outcome Measurements

- Blood Loss
- Length of Stay
- Rates of VTE

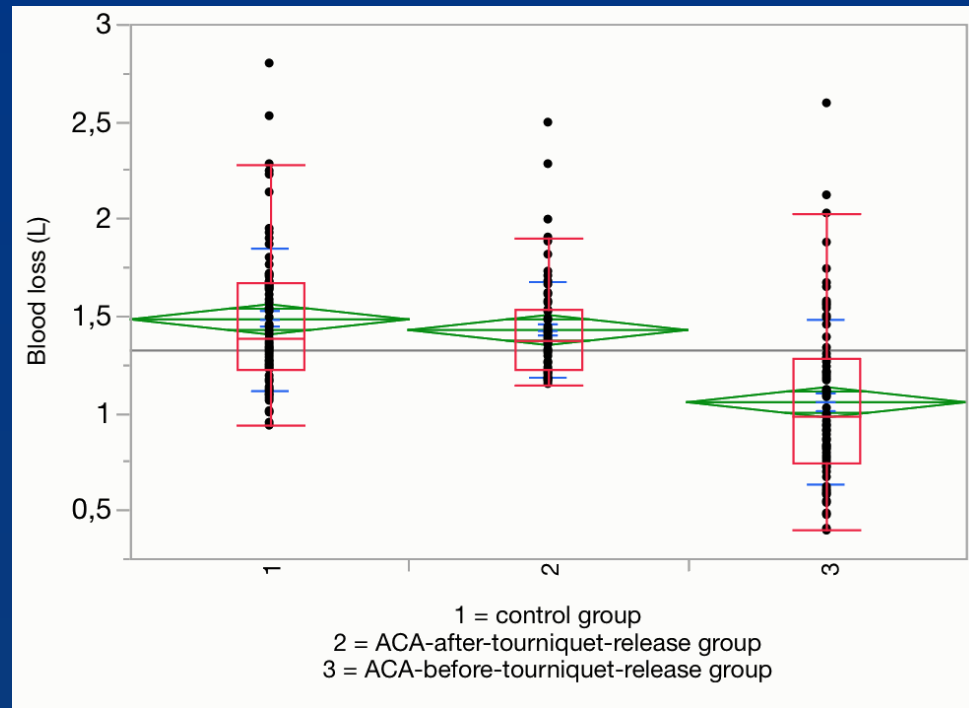
Blood Loss

	Control Group (N= 80)	ϵ -ACA-after- tourniquet-release Group (N= 80)	ϵ -ACA-before- tourniquet-release Group (N= 80)
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BLOOD LOSS			
Preoperative hemoglobin (g/dL) (mean \pm SD)	13.8 \pm 1.2	14.0 \pm 1.3	13.5 \pm 1.2
Lowest postoperative hemoglobin (g/dL) (mean \pm SD)	9.9 \pm 1.3	10.2 \pm 1.2	10.4 \pm 1.2
Estimated intraoperative blood loss (mL) (mean \pm SD)	223.4 \pm 128.1	203.4 \pm 79.5	159.6 \pm 81.2
Total blood loss (mL) (mean \pm SD)	1478.8 \pm 367.1	1424 \pm 249.3	1052.3 \pm 419.1

Reduction in blood loss

- Statistically significant reduction in blood loss of 426.5 ml
- $P < 0.05$
- No difference in transfusions



Length of Stay

	Control Group (N= 80)	ϵ -ACA-after- tourniquet-release Group (N= 80)	ϵ -ACA-before- tourniquet-release Group (N= 80)
Length of stay (days)	3.3 \pm 1.3	3.2 \pm 0.9	2.6 \pm 1.1
Disposition home	67	69	62
Disposition to skilled nursing facility	13	11	18

- Statistically significant reduction in length of stay of 0.7 days ($P < 0.005$)

Adverse events

- 1 patient (0.0625%) in the ϵ -ACA group developed VTE
- 1 patient (1.25%) in the control group developed VTE
- Treated with low molecular weight heparin followed by Coumadin for 6 months

Does Topically applied ϵ -ACA reduce blood loss in TKA?

- Statistically significant reduction in blood loss of 426.5 ml
- Systematic review by Kagoma et. showed 331 ml reduction in blood loss in THA and TKA with IV ϵ -ACA

Kagoma, Crouther, Doukhetis et al. Thromb Res 2009

Is ϵ -ACA safe for use in TKA?

- 1.25% rate of VTE in control
- 0.0625% rate of VTE in treatment group
- Churchill et al. J Knee Surg 2016 no increase in rates of VTE between TXA, ϵ -ACA and control in a comparative study with 2922 patients
- They found 0.82%, 0.73% and 0.8% VTE in TXA, ϵ -ACA and control respectively

Is ϵ -ACA Cost Efficient?

- Cost of ϵ -ACA at our institution: \$1.03 for 5g
- Cost of TXA in various studies: \$39.58-\$80
- Cost savings per dose: \$38-\$79 dollars per TKA

- \$38,000-\$79,000 savings per year in institution that performs 1000 TKA

Is ϵ -ACA Cost Efficient?

- Average cost of inpatient day in the hospital reported by the Kaiser Family Foundation:
 - \$2,271 for the United States
 - \$3,341 for California
- Average reduction of length of hospital stay of 0.7 days for ϵ -ACA
- the cost savings per patient using ϵ -ACA locally before tourniquet release are: $(0.7 \times \$2,212) = \$1,548.40$

Conclusion

- Topically Applied Epsilon-Aminocaproic Acid is a safe, effective and cost-efficient way to reduce blood loss in TKA

Thank you

- California Orthopedic Association
- Alexander Nedopil MD
- Mauro Giordani MD
- Mark Sucher MD

References

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Thank you

