Audit of transfusion rates in children with cerebral palsy following pelvic surgery, comparing groups with and without administration of tranexamic acid

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Introduction

Cerebral palsy (CP) is one of the most common causes of childhood disability (1). It is a clinical syndrome consisting of early-onset, non-progressive neuromotor disorders characterised by impaired motor movement and resultant musculoskeletal deformity (1,2).

Hip displacement is a common deformity among children with neuromuscular complex chronic conditions such as CP. Many of these children are treated with hip reconstruction surgery requiring blood transfusion.

Previous studies have demonstrated the safety and efficacy of Tranexamic acid (TXA), a synthetic anti-fibrinolytic agent used off-label to reduce peri-operative bleeding (Fig1) (3). However, little data exists regarding the use of TXA in children with CP undergoing pelvic osteotomy.

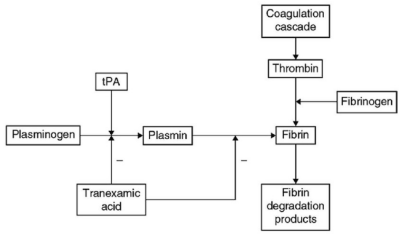

Fig. 1 TXA mechanism of action [3]

Children with CP are at a particularly high risk of perioperative bleeding, thought to be due to a combination of anti-epileptic medications, poor nutritional status, abnormal platelet function, depletion of clotting factors and abnormal connective tissue (4). Additionally, TXA has shown to increase the risk of seizure in higher doses.

Objectives & Methods

This audit aims to examine the efficacy and complications of using tranexamic acid (TXA) in patients with cerebral palsy treated with pelvic osteotomy surgery at QCH by comparing rates of blood transfusion, pre- to post-operative Hb change, estimated blood loss (EBL), cell saver use, and length of stay (LOS).

The study population will consist of 54 children between the age of 6 to 18 years diagnosed with cerebral palsy.

Data was collected for patients treated with pelvic osteotomy between 01/12/2014 and 01/07/2020.

Medical chart review was conducted for patient demographics, outcomes, and complications. Analysis was conducted as unpaired t-tests and Fisher exact test (ORs) for continuous and categorical variables, respectively.

Results

Table 1: Baseline information of cerebral palsy patients undergoing pelvic osteotomy treated with and without tranexamic acid.

			TXA (N=33)	Non-TXA (N=21)	P value
Patient Characteristics	Sex, n (%)	Male	16 (48)	15 (71)	0.1577
		Female	17 (52)	6 (29)	0.1577
	Age at surgery, years, (mean±SD)		8.8 ± 3.7	9.1 ± 4.3	0.7448
	Mass at surgery, Kg, (mean±SD)		27.1 ± 10.2	26.3 ± 10.6	0.7739
	GMFCS, n (%):				
	III or IV [1]		11 (33)	10 (48)	0.3924
	V		22 (67)	11 (52)	
Surgical Characteristics	Pelvic involvement, n (%)		33(100)	20(95)	0.3889

*indicates significance at the P<0.05 level
1. To conduct a Fisher exact test, GMFCS III and IV were combined. There was 1 GMFCS III in both TXA and non-TXA.

Table 2: Pre- and postoperative laboratory values, transfusion rates, estimated blood loss and cell saver details in cerebral palsy patients undergoing pelvic osteotomy.

	TXA (N=33)	non-TXA (N=21)	P value
Cell saver, n (%)	20 (61)	6 (29)	0.0278*
Cell saver Vol (ml), Mean	60.8	164.7	0.0310*
Estimated blood loss (mls) [2]	216.7	400.0	0.3551
Intraoperative transfusion rate, n (%)	2 (6)	1 (5)	>0.9999
Postoperative transfusion rate, n (%)	7 (21)	5 (24)	0.7479
Pre-operative Hb (g/L) [2]	124.9	131.8	0.1102
Post-operative Hb (g/L) [2]	90.9	87.7	0.4206
Change pre- to postoperative Hb (g/L)[2]	-29.41	-42.73	0.1522
Length of stay (days)	8.7	6.7	0.1822

*indicates significance at the P<0.05 level
2. Some values were unavailable in the anaesthetic records. The altered sample sizes are: EBL: TXA n=3, Non-TXA n=5. Preop Hb: TXA n=25, Non-TXA n=13, Postop Hb: TXA n=27, Non-TXA n=14, Change Hb: TXA n=22, Non-TXA n=11

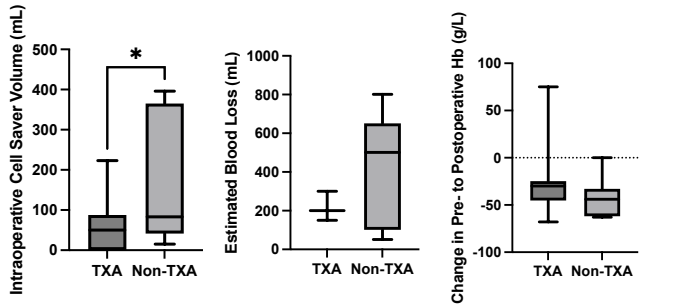

Figure 1.Main findings. Left: Intraoperative cell saver volume (mL)- Middle: Estimated blood loss (mL)- Right: Change in pre- to postoperative hemoglobin (Hb) levels- in patients with Cerebral Palsy who underwent pelvic osteotomy, separated by those who received tranexamic acid, and those who did not.

Conclusions

Findings for TXA use

- There was a **significant** reduction in cell-saver volume when using TXA.
- The mean estimated blood loss was reduced when using TXA **(ns)**. However, EBL was highly under-reported in anaesthetic records and is considered an arbitrary reporting method of blood loss even when used.
- The mean pre- to postoperative Hb change (g/L) was reduced when using TXA **(ns).**
- Upon review of medical records there were no identification of TXA-related complications.

Findings against TXA use

- There is no discernible difference in transfusion rates between TXA and non-TXA groups.
- More cell saver use was seen in the TXA group **(significant)**. However, this is likely due to the hemodynamic demand of the patients indicating the use of blood salvaging techniques. As both TXA and cell saver use are decided before surgery based on surgical parameters and likelihood for blood loss.
- Length of stay was higher in the TXA group **(ns).**

Limitations/Recommendations

- Even though there were no significant variations in patient demographics, propensity matching would make the results more convincing, but this was not possible due to the limited sample size.
- Cell saver is a significant confounder of the results. Patients that require blood salvaging techniques are likely to get both TXA and cell saver, making it difficult to discern the efficacy of TXA alone. Dividing patients by cell-saver use would reduce confounding. Preliminary subgroup analysis of this demonstrated more convincing results for transfusion rates and Hb change, albeit insignificant findings given the restricted sample size.
- As a single-centre study, meeting sample sizes sufficient to run higher power analyses is an ongoing problem. As indications for transfusion, TXA or cell-saver use is left to the judgement of physicians caring for the child, it is difficult to ethically source a large, homogenous sampling pool.

References

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