Every drop counts; comparing methods for measured and estimated blood loss in obstetric theatres

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Introduction

- Estimation of blood loss in obstetrics is challenging, especially for larger blood volumes
- Prior to March 2021 at Liverpool Women's Hospital, two retrospective methods were used; visual estimation, which can be inaccurate[1], and multiplication of the cell salvage (CS) return volume by 3 (CSRV3), used as an approximation of blood loss[2]
- In March 2021 gravimetric and volumetric measurement of blood loss was implemented
- This evaluation aimed to compare accuracy of surgical estimated blood loss (EBL) and CSRV3 methods with measured blood loss (MBL)

Methods

- Blood loss was measured from main suction and CS suction, and weighed from swabs and Inco pads
- Swabs were weighed before washing for CS
- MBL was concealed from surgical team unless clinically required
- Surgical EBL and CSRV3 were recorded
- Surgical and CSRV3 estimates were compared with MBL using Bland-Altman analysis

References

1. Gerdessen L, Meybohm P, Choorapoikayil S *et al.* Comparison of common perioperative blood loss estimation techniques: a systematic review and meta-analysis. Journal of Clinical Monitoring and Computing. 2021; 35: 245-258. https://doi.org/10.1007/s10877-020-00579-8
2. Brearton C, Bhalla A, Mallaiah S, Barclay P. The economic benefits of cell salvage in obstetric haemorrhage. International Journal of Obstetric Anaesthesia. 2012; 21(4): 329-333. https://doi.org/10.1016/j.ijoa.2012.05.003

Figure 1: Bland-Altman plot comparing Estimated Blood Loss (EBL) and Measured Blood Loss (MBL) for elective and emergency caesarean sections (n=46)

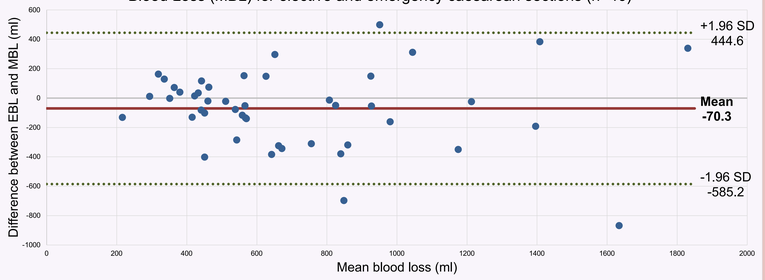


Figure 2: Bland-Altman plot comparing Estimated Blood Loss (EBL) and Measured Blood Loss (MBL) for repair of perineal tears and Forceps deliveries (n=10)

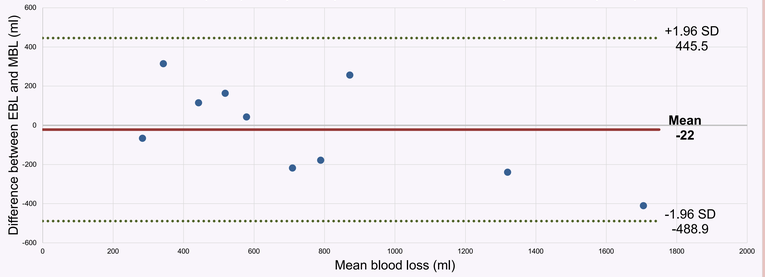
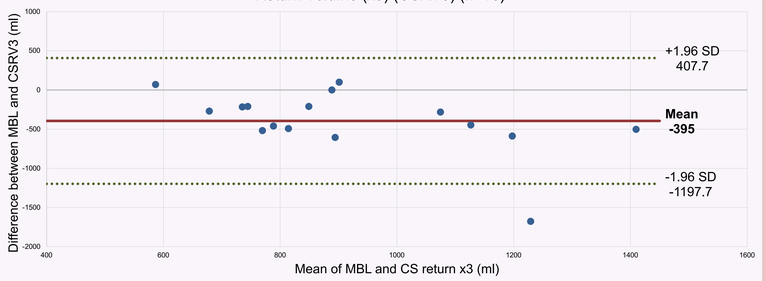


Figure 3: Bland-Altman plot comparing Measured Blood Loss (MBL) and Cell Salvage Return Volume (x3) (CSRV3) (n=16)



Results

- Fifty-six data sets were collected (25 emergency and 21 elective caesarean sections, 6 forceps deliveries, 4 perineal repairs)
- Mean MBL was 590ml for elective caesarean sections, 862ml for emergency caesarean sections, and 767ml for vaginal procedures
- EBL underestimated MBL in 66% of elective (n=14) and 60% of emergency caesarean sections (n=15)
- Bland-Altman analysis showed a bias (limits of agreement, LOA) of -70ml (-585 to +444ml) when using surgical EBL for caesarean sections *(Figure 1)*, and -22ml (-489 to +446ml) for vaginal cases *(Figure 2)*
- The difference increased with increasing blood loss, and for emergency cases
- CS was used in 65% of caesarean sections (n=31) of which 52% (n=16) produced a return
- Using the CSRV3 method resulted in a bias (LOA) of -395ml (-1198 to +408ml) *(Figure 3)*
- Blood was present on sources other than swabs and suction (Inco pads/floor) in 70% of cases (n=39), with a median volume of 106ml (IQR 70-135ml, max 883ml)

Discussion

- Blood loss estimation using surgical EBL and CSRV3 were shown to be inaccurate with a wide variability, amplified as blood loss increased
- The CSRV3 only accounts for blood that has passed through the CS and significant blood loss may be present elsewhere
- This evaluation supports the implemented cumulative measurement of blood loss from all sources, allowing early intervention and swift clinical decision-making