



**36th South African
NATIONAL BLOOD
Transfusion Congress**

22 – 25 August 2022 - Durban

SHAPING A SUSTAINABLE FUTURE

Comparing the Degree of Red Cell Haemolysis, Including Blood Volume Yielded, Between Two Techniques of Extracting Blood from Surgical Swabs

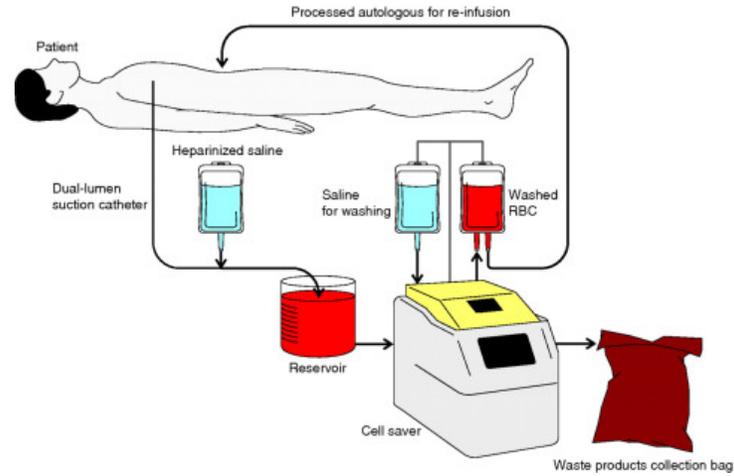
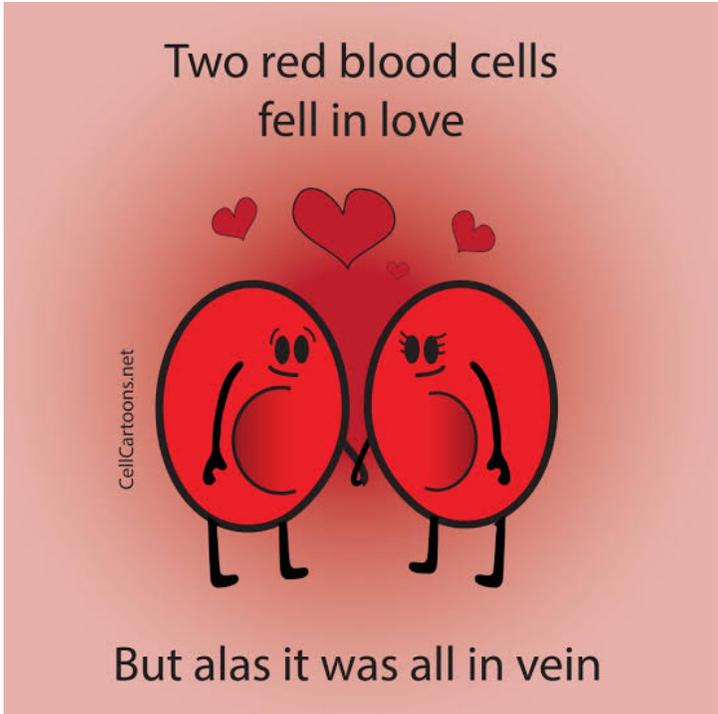


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- *24/08/2022*



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(Image from a review article by
A.Ashworth and A.A Klein)

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The logo features a stylized red and green blood drop held by two hands. The text is arranged in a hierarchy, with the congress name in large bold letters, the dates and location below, and the slogan at the bottom.

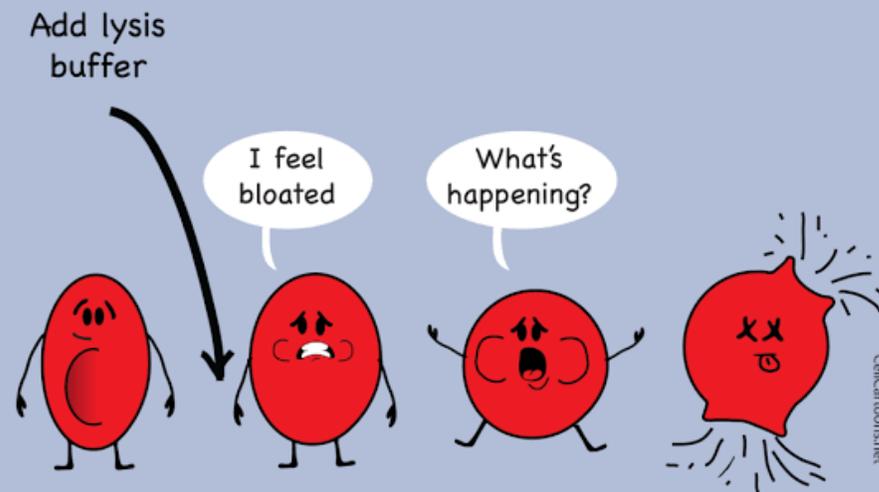


Background and Motivation



- Intra-operative cell salvage can limit the use of allogenic blood during surgical procedures.
- These mechanical cell saving devices allow for the collection of blood via suction and from soaked surgical swabs.
- Haemolysis of red blood cells due to recovery processes from the surgical field decreases the potential advantages from cell salvage.
- The practice of washing swabs and haemolysis therein, had not been investigated.

Red Blood Cell Lysis





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Aims

- Primary Aim: To compare the degree of red cell haemolysis between two techniques of extracting blood from surgical swabs.
- Secondary Aim: To determine the volume of whole blood, mixed with 0.9% saline and heparin, recovered with each of the two techniques of swab extraction.

Methods

- Approval was obtained from Mmed, Ethics and SANBS Ethics committees.
- In vitro, experimental study.
- Performed in the theatre environment at Kalafong Provincial Tertiary Hospital.
- Donated, human whole blood was utilized.
- Standard PPE was provided.
- Ten comparative experiments were performed.
- Steps 1-4 (next slide) were repeated 10 times by a single operator (intern doctor), alternating techniques between each experiment run.

1. PRE-EXTRACTION SAMPLING

- 50 mL heparin saline mixture added to 100 mL blood - from same donor - in 2 identical surgical bowls (A&B)
- Bowls rotated gently to allow mixing of heparin saline and blood
- 5 mL samples taken from bowl A&B with a 5 mL syringe - for baseline LDH levels

2. EXPERIMENT

- Surgical swab submerged into each bowl
- BOWL A - Technique 1 performed i.e. pressurized extraction technique
- BOWL B - Technique 2 performed i.e. gravity/free drainage extraction technique

3. POST-EXTRACTION SAMPLING

- Standardization of 15 minutes waiting time for each bowl before post extraction samples taken
- Bowls rotated gently - to reduce sedimentation
- 5 mL sample taken with 5 mL syringe from base of both bowls for LDH levels
- All 4 samples (pre and post) taken to NHLS for processing

4. BLOOD VOLUME MEASUREMENT

The volume of blood remaining in each bowl was measured to determine the yield of blood returned with both techniques

Steps 1 to 4 were repeated 10 times by a single operator. The order of techniques alternated between each experiment run



Gravity vs Pressure Technique

Data Analysis

- Primary Aim – Degree of Haemolysis:
 - The change in LDH from pre-extraction to post-extraction for each technique was compared using the Analysis of Covariance(ANCOVA) prediction model.
- Secondary Aim – Volume Measurement:
 - A T-test was used to compare the mean volumes returned.

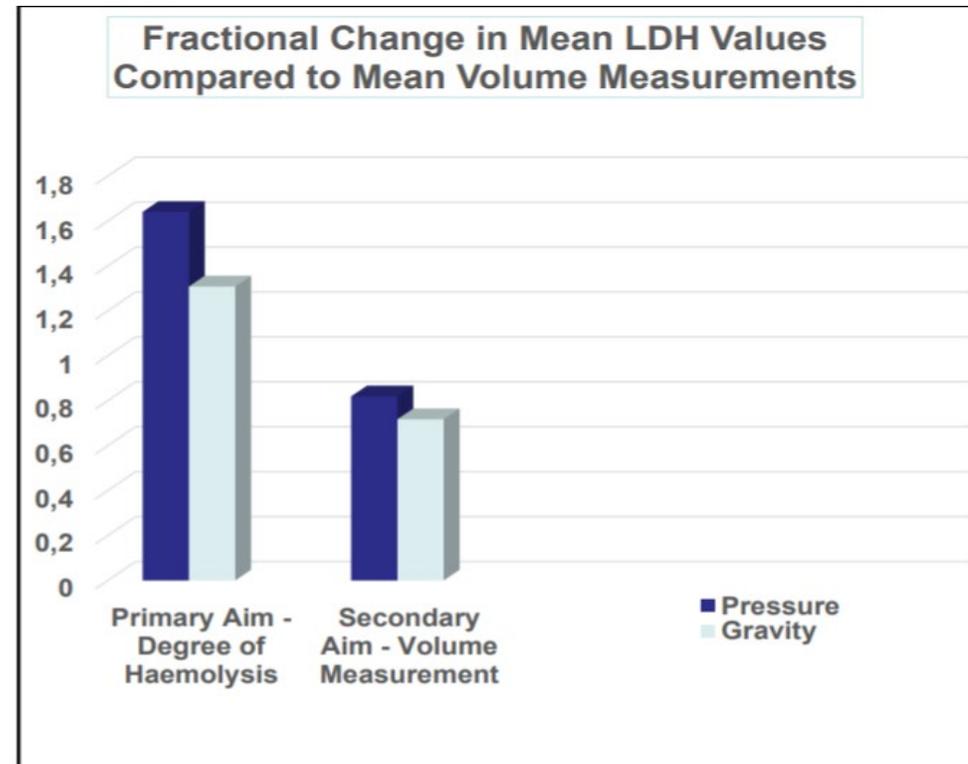
Results

- A significant difference was found between the two techniques with the pressure technique demonstrating more haemolysis (indicated by LDH levels) than the gravity technique: p-value < 0.0001.
- A noted difference was also found in the volumes of blood returned, with the pressure technique yielding a greater volume: p-value < 0.0001.

	Pressure Technique	Gravity Technique	P-value
Primary Aim: Mean Change in LDH (U/L)	68,8	32,2	<0.0001
Secondary Aim: Mean Volume Returned (ml)	122,9	107,66	<0.0001

Results

- The fractional change from baseline was calculated and compared for both aims.



Results

- The magnitude of the difference between each technique and for each aim was then expressed as a percentage:
 - 33.2% fractional increase in LDH – *Pressure > Gravity*
 - 10.2% fractional increase in total volume returned – *Pressure > Gravity*
- Other factors:
- **Temperature:** Mean temperature of bowl contents at the end was 18.82 degrees Celsius. A low SD (0.2097) – suggests consistency in fluid temperatures.
- **Age of blood units:** Mean age of blood units used was 4.5 days.

Discussion – What does this all mean to us?

- Red cell recovery rates for intra-operative cell salvage, can potentially improve by utilizing a swab extraction technique that reduces haemolysis.
- The relative increase in LDH (33.2%) for the pressure technique overshadows the relative volume gain benefit (10.2%) of this technique.

Limitations

- Small sample size.
- Stored blood units used instead of fresh blood.
- Single operator for all experiments.

Recommendations

- Suggested clinical practice may be to combine the two techniques i.e. use gravity to drain the swab initially and then empty the remainder of the swab using pressure.
- Further research, on a larger scale, and including a combination of both techniques, is suggested.



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