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Sterile water give better visualization than 0.9%NaCl and 1.5% Glycine irrigation in Transurethral resection of prostate gland

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Abstract

Objective: To compare light absorption among sterile water, 0.9%NaCl ,and 1.5% Glycine contraminated with different concentration of blood.

Material and Method: The three irrigants were mixed with fresh blood in ratios of 0.1 ml blood per 300 ml irrigant and increased in increments of 0.1 ml of fresh blood till it reached concentration of 3.0 ml fresh blood per 300 ml irrigant. Each specimen was measured for light absorption by U-1000 Spectophotometer in % light absorbance measurement (%ABS) mode. The results were compared by Paired T-test.

Results: Experimental research and Independent paired T-test. Showed that Sterile water had significantly less % absorbance measurement than 0.9% NaCl (p-value < 0.05) and 1.5% Glycine (p-value < 0.05).

Conclusion: Sterile water irrigation during TUR-P should provide better visualization than 0.9%NaCl and 1.5% Glycine, and should be used in monopolar TUR and laser TUR.

Key words: The U-1000 Spectophotometer, percent light absorbance measurement (%ABS), the light transmission

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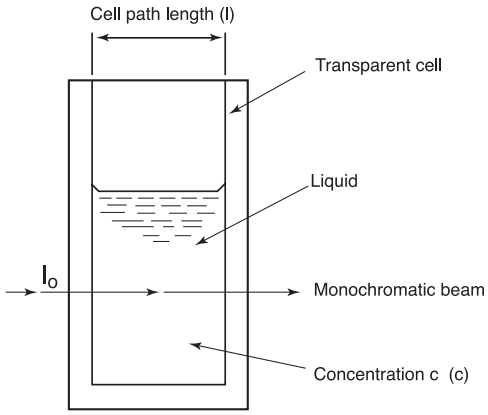
Introduction

Good vision is essential to successful Transurethral Resection of the Prostate. Irrigation fluid help clear the surgical field of active bleeding, improving visualization[1,2,3]. From previous experience, during TUR-P, using sterile water (as in monopolar TUR) compared to 1.5% Glycine and 0.9%NaCl (as in bipolar TUR) gave better vision of operative field. The study was to proof it in terms of light absorption measurements.

Material and Method

The U-1000 Spectophotometer is designed for absorption analyses of liquid, solid and gaseous samples in ultraviolet, visible and near infrared spectral regions. Formulated through Hitachi's tradition of innovation and excellence in the field, the Model U-1000/ U-1100 Spectrophotometer.

Fig 1 *The U-1000 Spectophotometer*



$$I_t / I_o = 10^{-\varepsilon \cdot c \cdot l} = t$$

Fig 2 *The statement of Lambert-Beer law.*

A monochromatic beam with intensity "I_o" travels through a liquid phase having concentration "c" and path length "l", which results in the monochromatic radiation intensity decreasing to "I_t" .

"ε" is a constant known as absorptivity, which varies depending on the sample.

"t" indicates transmittance which is often

Also, the common logarithms of inverse transmittance can be expressed as follow :

Log (1/t) = $\varepsilon \bullet c \bullet l = E$

"E" is called absorbance. Absorbance "E" is proportional to concentrarion "c" and is a unit of measurement in dispensable for quantitative determination.

The three irrigants were mixed with fresh blood in the ratios of 0.1 ml blood per 300 ml irrigant and increased in increments of 0.1 ml of blood till its reached concentration of 3.0 ml blood per 300 ml irrigant. Each specimen was measured for light absorption (Absorbance "E") by The U-1000 Spectophotometer in percent light absorbance measurement (%ABS) mode. The results then were compared by Paired T-test.

Table 1 *Three different irrigation fluids (Sterile water ; Sub1 ,0.9% NaCl; Sub 2 ,1.5% Glycine; Sub 3) were compared in the U-1000 Spectophotometer. Compared in term Absorbance "E"*

	Water	0.9%NaCl	1.5%Glycine
0.0 ml/300 ml irrigant	0	0	0
0.1 ml/300 ml irrigant	0.001	0.004	0.005
0.2 ml/300 ml irrigant	0.003	0.010	0.009
0.3 ml/300 ml irrigant	0.006	0.012	0.012
0.4 ml/300 ml irrigant	0.006	0.014	0.013
0.5 ml/300 ml irrigant	0.008	0.015	0.015
0.6 ml/300 ml irrigant	0.010	0.016	0.016
0.7 ml/300 ml irrigant	0.011	0.017	0.016
0.8 ml/300 ml irrigant	0.012	0.018	0.017
0.9 ml/300 ml irrigant	0.013	0.018	0.017
1.0 ml/300 ml irrigan	0.015	0.018	0.017
3.0 ml/300 ml irrigan	0.018	0.018	0.019

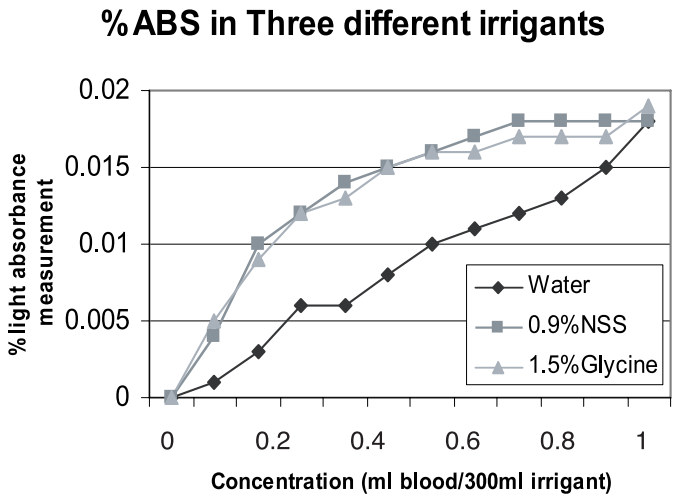


Diagram 1 *Correlation between % light absorbance measurement and concentration of mL blood per 300 mL irrigants*

The software used for statistical and version 12.0 (SPSS Inc, Chicago) Windows.

Results

Independent paired T-test, compared into three groups. Showed that sterile water had significantly less Absorbance "E" measurement than 0.9% NaCl (p-value 0.025) and 1.5% Glycine (p-valve 0.020). Sterile water was good vision than 0.9% NaCl. Sterile water was good vision than 1.5% Glycine.

0.9% NaCl was not significantly in Absorbance "E" when compared with 1.5% Glycine (p-valve 0.844).

Table 2 *Mean absorbance E comparing between Water and 0.9% NaCl*

Water	0.9% NaCl	P
0.009±0.005	0.01459±0.004	0.02

Table 3 *Mean absorbance E comparing between Water and 1.5% Glycine*

Water	1.5% Glycine	P
0.009±0.005	0.014±0.004	<0.025

Discussion

The irrigation fluids used in TUR-P range from sterile water to many non-hemolytic irrigants such as glycine, sorbital, and mannitol solutions. Hemolysis during TUR-P could happen especially when using sterile water as the irrigating fluid and could be prevented by isotonic fluids such as sorbitol or mannitol[4]. Monopolar TUR-P requires the use of nonconductive fluid irrigation to maintain vision during resection. While nonconductive fluids allow the use of electrocautery for resection, they are hypotonic, rather than isotonic, in nature[5]. Using sterile water as an irrigant for TUR-P might cause hemolysis. As an isotonic electrolyte medium, normal saline is the most physiologic irrigate for TUR-P[5,6], but its electrical conducting properties prohibit its use during a conventional monopolar procedure. 1.5% Glycine irrigation is a sterile, nonpyrogenic, nonhemolytic, nonelectrolytic or very weakly ionized solution, and provides a high degree of visibility for TUR-P.

Sterile water was hypotonic, hemolytic ,non-electrolyte irrigation fluid[4]. Its had good vision than isotonic ,nonhemolytic ,electrolyte irrigation fluids[4]. The study was to proof sterile water gave the best visualization than 0.9% NaCl and 1.5% Glycine. The optical clarity of plain water is indisputable, and the optical distortion resulting from substances added to make the solution isotonic will be even more aggravated by incomplete mixing[7]. The ideal situation is to have the isotonic solution ready mixed for the theatre, and these vary from one of the sugars, such as dextrose or manitol[7]. I think, the degree of visibility was depended on hemolytic property. When red blood cell were hemolized, the visualization were improver until the maximal point of concentration of ml blood per 300 ml irrigant. In this study 3.0 ml blood/300 ml irrigant, its was not differented in visualization.

Conclusion

Sterile water irrigation during TUR-P should provide better visualization than 0.9% NaCl and 1.5% Glycine and should be used in monopolar TUR and laserTUR[8]. Irrigation mainly for distention and improved visibility during procedure.

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