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THE CLINICAL EVALUATION OF A RAPID METHOD FOR THE PRESURGICAL C--ETC(U)  
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#### ABSTRACT

A new rapid method of presurgical cleansing of hands has been evaluated in a clinical setting. The effectiveness of a 90 second jet wash has been compared with a standard 10 minute presurgical scrub. Bacteriological cultures were obtained from fingertips of interns, residents and staff of the Department of Obstetrics and Gynecology of the Walter Reed Army Medical Center, before and after 90 second jet washings and 10 minute conventional scrubs. The results revealed that the 90 second jet wash was more effective in degerming the hands than the 10 minute standard brush scrub. Other advantages of the new method, such as the amount of time saved, the standardization of cleansing, and reduced skin irritation are discussed.

The techniques and concepts of surgery have advanced very dramatically in the past several decades. One area, however, which has changed very little is the method of presurgical scrub. A radically new technique of rapid presurgical scrub - Hydroscrub - has been developed by the United States Army Institute of Dental Research at Walter Reed Army Medical Center. This device delivers the scrub solution to the arms and hands through a series of jets at a constant rate of 1200 pulses per minute. The solution can be delivered at variable pressures up to 200 pounds per square inch (PSI) and is timer controlled to give scrub durations of 30 seconds to 5 minutes. Evaluation of the effectiveness of this method using non-clinical personnel has been reported.<sup>3,6</sup> This study was designed to compare the effectiveness and acceptance of this method of presurgical hand cleansing with the standard 10 minute presurgical scrub in a clinical setting. It was felt that an effective rapid method of presurgical scrub would have special applicability in obstetrics where the standard 10 minute scrubs are frequently impossible. In addition, frequent scrubbing is required for the many minor surgical procedures in gynecology. The abbreviated scrub should save considerable operating room personnel time and reduce skin irritation.

#### METHODS AND MATERIALS

The Arm and Hand Washer (Fig. 1) was tested for its effectiveness on surgical personnel consisting of 10 members of the Department of OB/GYN at Walter Reed Army Medical Center including interns,

residents and staff physicians. Utilizing this device both arms and hands were washed with Betadine Solution\* (253 x diluted) for 90 seconds at pressures of 120 pounds per square inch (PSI). The solution in the reservoir tank was recirculated for use in multiple washings and was changed every 24 hours. In addition, the effectiveness of a standard 10 minute presurgical brush scrub utilizing Betadine Surgical Scrub\* according to protocol (Table I) was evaluated on the same subjects.

Each participant served as his own control. A total of 5 standard 10 minute presurgical hand and forearm cleansing procedures and 5 ninety second hydroscrubs were performed by each subject prior to such minor procedures as vaginal delivery, abortions, and laparoscopic tubal ligations. The effectiveness of both methods of presurgical preparation of the hands was assessed by the fingertip impression method using trypticase soy agar as a culture medium. The cultures of fingertips were obtained immediately prior to and immediately after the hydroscrub and the standard scrub. All plates were incubated at 37°C and examined after 24 and 48 hours.

Eighty-four prescrub cultures of the fingertips showed heavy and confluent growth, making it impossible to count the bacterial colonies. In such cases, counts of 50 per fingertip, or a total of 250 as a maximal count for the five fingertips were recorded. No attempt was made to identify the microorganisms. The mean colony count per hand of each subject prior to each of the scrubs

\* Purdue Frederick Co., Yonkers, N.Y.

was compared with the mean count after each scrub and then the two methods compared.

## RESULTS

The results are summarized in Table II. Bacterial counts per 5 fingertips in the hydroscrub group before cleansing ranged from 54.9 to 178.5 with an average for 10 subjects of 116.6. Cultures of fingertips immediately after the hydroscrub showed bacterial counts ranging from 0.7 to 6.9 colonies with an average of 3.3 . The difference between pre and post wash results is statistically significant ( $P < .001$ ) using student's paired "t" test.

Average prescrub bacterial count before the conventional 10 minute presurgical scrub was 85.7 colony forming units and the post scrub count was 7.9. The post scrub reduction of bacterial counts for this method is also statistically significant ( $P < .001$ ).

Comparison of mean percent reduction for the hydroscrub group of 97.2 with 90.8 for the conventional scrub group indicates that the hydroscrub may be more effective than the conventional scrub. The difference between the two methods, however, is not statistically significant.

## DISCUSSION

The results of this study are in agreement with hydroscrub studies on non-clinical personnel reported earlier.<sup>3,6</sup> The 90.8 percent reduction of bacterial numbers following 10 minute conventional surgical scrub (Table II) is similar to the 91 and

94 percent reduction reported by Dineen<sup>4</sup> and Bernard<sup>2</sup> respectively.

A 10 minute scrub was chosen as a control because this is the most commonly used duration of scrub. In our standard scrub series two individuals had high bacterial counts after routine scrubs. We feel this points up a shortcoming inherent in the standard scrub. The results depend on the individual's experience, technique, motivation and circumstance. All scrubs in this study were closely supervised to keep these variables to a minimum.

The effectiveness of the hydroscrub was significantly better than that of the standard scrub with a reduction to an average of 3.3 organisms per hand compared to the 7.9 organisms per hand for the standard scrub. The percent reduction (97.2) was also higher than that reported in the series previously quoted.<sup>2,4</sup> The reduction was constant and uniform for all individuals. The hydroscrub technique is standardized by machine and is not dependent on the individual variables previously cited. Therefore, inexperienced personnel are able to consistently achieve results as good as the most experienced scrub nurse.

The principle of pulsating pressure jets became familiar through the use of oral irrigation devices. The United States Army Institute of Dental Research developed a wound lavage jet device which was used extensively during the Viet Nam War for the debridement of combat wounds.<sup>1,5</sup> The present hand wash machine is another application of these already well proven uses for the jet wash principle. Future uses of this method of hand scrubbing other than in the presurgical area may

involve hand cleansing on post surgical wards, in newborn nurseries  
etc.

#### SUMMARY

The results of the jet wash experiments have shown that the  
hydroscrub is:

1. As efficient in hand cleansing as conventional methods
2. At least 6 times faster.
3. Less irritating to the skin.
4. Gives more consistent results.
5. Clinically acceptable.

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TABLE I

Protocols for Hand Cleansing Methods

Conventional Brush Scrub (10 min)

1. Moisten hands and forearms.
2. Clean under fingernails.
3. Lather hands and forearms to 3 inches above the elbow.
4. Rinse thoroughly.
5. Use sterile scrub brush to lather hands and forearms for 3 minutes.
6. Rinse thoroughly with tap water.
7. Repeat 5 and 6.
8. Dry with sterile towel.

Jet Wash (60 sec)

1. Insert arms into scrubber.
2. Adjust timer to 90 seconds.
3. Remove arms when scrubber stops.
4. Rinse thoroughly with tap water.
5. Dry with sterile towel.

TABLE II

Average bacterial counts (colony forming units) per hand before and after the jet wash and the standard scrub

SUBJECT	JET WASH SCRUB		STANDARD SCRUB	
	PRE	POST	PRE	POST
GB	66.3*	1.3*	26.7*	2.6*
LD	107.5	2.4	75.4	4.3
PD	54.9	3.7	39.0	39.2
PH	100.8	3.0	124.5	1.3
KK	112.6	0.7	118.0	0.3
HL	142.1	3.5	114.7	17.2
TM	100.0	2.5	70.9	2.6
FM	150.4	5.4	113.1	4.2
KS	153.4	4.0	76.3	0.1
RT	178.5	6.9	97.1	7.4
AVERAGE	116.6	3.3**	85.7	7.9**
% REDUCTION	97.2		90.8 ***	

\* Average of 5 determinations

\*\* Significant ( $P < .001$ )

\*\*\* Non significant