Bacterial Skin Floral Pattern and their Sensitivities to Skin Cleaning Lotions at Nnamdi Azikiwe University Teaching Hospital, Nnewi.

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SUMMARY

Background: **Postoperative wound infection has remained a major cause of morbidity and mortality in surgical patients. Bacteria skin flora of the patient plays a big role in its causation. Preoperative skin preparation using effective antiseptic lotions reduce the flora to inconsequential levels that they cannot infect the wounds.**

Objectives: **To determine the bacterial skin flora pattern and the effectiveness of the skin cleaning lotions used at Nnamdi Azikiwe University Teaching Hospital, Nnewi.**

Methods: **Volunteers with no skin lesions were drawn from patients and hospital community. The skin of the antecubital fossa of each volunteer was sampled with sterile swabs before (swab I) and after (swab II) disinfection using antiseptic lotions A [chlorhexidine 0.75% (w/v) and cetrimide 0.75% (w/v)], lotion B [chlorhexidine 0.5% (w/v)] on the left and the right arms respectively. All samples were cultured aerobically and anaerobically. The sensitivities of the bacterial isolates were tested against lotion A and B.**

Results: **164 volunteers were enlisted. Mean age was 28.7 ± 13.1 years. M:F = 1.4:1. Skin colonization rate was 97.6% with staphylococcus epidermidis accounting for 82.3%, Staphylococcus aureus 6.7%, E.coli 3.7%. Mixed growth of Staphylococcus and E.coli was seen in 4.9%. No anaerobe was isolated. No organism was isolated from swab II taken after the disinfection of the skin, while there was 0.6% resistance rate to lotion B only.**

Conclusion: **Skin cleaning agents used at Nnamdi Azikiwe University Teaching Hospital, Nnewi are effective against the usual bacterial skin flora encountered in our environment.** *Niger Med. J, Vol 46, No.3, July – Sept., 2005: 57 – 59.*

KEY WORDS: ***Skin, bacterial flora, postoperative infection, antiseptic lotions.***

INTRODUCTION

Postoperative wound infection has remained a major cause of morbidity and mortality in surgical practice. It increases the length of hospital stay as well as cost of treatment (1-4). In their review, Mangram *et al.*(3) noted that 77% of deaths in surgical patients were related to surgical wound infection, while Kirkland *et al.*(4) calculated a relative risk of death of 2.2 attributable to surgical site infections compared to matched surgical patients without infection. A number of factors, which influence or predispose to the establishment and severity of wound infections, have been identified. These include the host immune status, concomitant illness especially infection, tissue damage, and most importantly the presence in adequate numbers of virulent organisms beyond the ability of the local tissue to contain the invasion and destroy them (5,6).

In a survey sponsored by World Health Organization, it was demonstrated that the prevalence of nosocomial infections varied from 3% to 21%, with wound infection accounting for 5.34% of the total (7). In the USA, it is estimated that surgical site infections account for 14 – 16% of the nosocomial infections in hospitalized patients (8). In Nigeria, studies carried out in Ibadan showed that the prevalence rate of surgical wound infection rose from 4.4% in 1979 to 4.9% in 1997 (9,10). In another study carried out in Lagos, the monthly prevalence of nosocomial infections ranged from 0.11 – 8.1%, with surgical wound infection being responsible for 55.2% of the total (11).

Though most resident flora like *Staphylococcus epidermidis*, micrococci, diphtheroid bacilli and even *Escherichia coli* are harmless commensals, most postoperative infections are caused by bacteria resident on the patient's skin or as cross-infection from the flora of other patients and the hospital workers. Studies have shown that the microbial flora of concern in wound infection are those that can move across the surface of the skin to the wound boundaries when wet or damp, under the drapes or dressings during surgical procedures (12,13). The general aseptic principle applied in surgery is aimed at eliminating the transfer of organisms to the wound from the materials used at operation, hospital workers and the environment. It is a well known fact that there is increased antimicrobial resistance among the flora present on the skin of hospital workers and patients hospitalized for a reasonable length of time (14). The patient's skin disinfection prior to surgery is targeted at reducing the skin flora to uninfective levels. Over the years, the skin preparation has changed from mere washing to the use of effective bactericidal lotions (5,15), though emergence of resistant bacterial strains to some of them have been reported (16,17). Chlorhexidine lotion has been noted to enhance the bactericidal activity of cephalosporins against the otherwise resistant pseudomonas and enterococci, thus rendering them susceptible (18). However, in a study of 5536 patients, Ayliffe *et al.*(19) demonstrated that preoperative bathing with chlorhexidine-detergent failed to influence the incidence of wound infection. Despite all these constrasting findings, it is obvious that the introduction of antiseptic lotion has reduced wound infection as well as improved the outcome of operations.

In this study, we aim at determining the bacterial skin

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flora pattern and the effectiveness of the lotions used in skin and wound disinfection in our surgical practice at Nnamdi Azikiwe University Teaching Hospital, Nnewi. This will help to evaluate our current antiseptic policy and effective infection control plan.

MATERIALS AND METHODS

Volunteers with no skin lesions were drawn from patients and hospital community. The skins of the ante-cubital fossa were sampled with sterile swab (swab I). The same sites were disinfected using antiseptic lotions A and B on the left and the right respectively.

Lotion A – Solution of chlorhexidine 0.75% (w/v) and cetrimide 0.75% (w/v) BP, Lotion B – Solution of chlorhexidine 0.5% (w/v) B.P. (These dilutions are according to the manufacturer's instructions).

The ante-cubital fossae were then swabbed 3 minutes after disinfection (swab II). Samples (swabs I and II) were each inoculated unto 3 culture plates: blood, McConkey and chocolate agar plates respectively. One set was incubated aerobically at 37°C for 24 hours while the other was incubated anaerobically for 48 hours using the Oxoid gas-pak system. The plates were read after 48 hours and any bacterial growth identified by standard methods (20). All the isolates were subjected to gram staining. The gram positive organisms were subjected to catalase test to differentiate staphylococcus from streptococcus, while the staphylococcus species were further subjected to coagulase testing to differentiate staph. aureus from staphylococcus epidermidis. Gram negative organisms were further characterized and E.coli was identified as red colonies in MacConkey using its ability to produce the enzyme beta-glucuronidase. The development of yellow colour following application of PGUA tablet indicates a positive reaction.

Plates without growth were further incubated for another 24 hours before being discarded as showing no growth. Isolated organisms were inoculated unto sensitivity discs prepared with lotion A and lotion B respectively. These were read after 24 hours.

RESULTS

A total of 164 volunteers were enlisted in this study. The distribution of the volunteer population is shown in table 1. Ninety patients (54.9%) were enlisted with inpatient and outpatients accounting for 23.2% and 31.7% respectively, while the rest were drawn from the hospital staff and medical students. Mean age was 28.7 ± 13.1 years with a range of 14 – 80 years. The M:F ratio was 1.4:1. Bacteria were isolated from 98.2% of specimens taken from the skin before disinfection (swab I), while none was isolated in swab II taken 3 minutes after skin disinfection. The distribution of the organisms isolated was staphylococcus epidermidis 86.0%. *Staphylococcus aureus* 8.5% and *Escherichia coli* 3.7%. No anaerobe was isolated. *E.coli* was isolated from among the inpatient population. Table 3 shows the sensitivity pattern of the isolated organisms to lotions A and B. All the isolates were sensitive to lotion A while only one (0.6%) was resistant to lotion B. This resistant organism was E.coli isolated from one patient who had been using urinary catheter for more than one month while awaiting prostatectomy for benign prostatic hyperplasia.

Table 1: Distribution of the Volunteer Population.

	Volunteers	No	%
1.	Patients	90	54.9
	a. inpatient	(38)	(23.2)
	b. outpatient	(52)	(31.7)
2.	Doctors	15	9.2
3.	Nurses	15	9.2
4.	Other workers	14	8.5
5.	Medical students	30	18.3
	Total	164	100

Table 2: Bacterial isolates from the skin of 164 cases.

S/N	Organism	Swab I		Swab II	
		No	%	No	%
1.	*Staphylococcus albus*	141	86.0	0	0
2.	*Staphylococcus aureus*	14	8.5	0	0
3.	*Escherichia coli*	6	3.7	0	0
4.	No growth	3	1.8	164	100
	Total	164	100	164	100

Table 3: Sensitivity of the isolated organism in Swab I to Lotions A & B.

S/N	Organism	No isolated	Lotion A	Lotion B		
			S	R	S	R
1.	*Staphylococcus albus*	141	141	0	141	0
2.	*Staphylococcus aureus*	14	14	0	14	0
3.	*Escherichia coli*	6	6	0	5	1

Lotion A: Chlorhexidine 0.75% (w/v) and Cetrimide 0.75% (w/v) BP

Lotion B: Chlorhexidine 0.5% (w/v) B.P.

S = Sensitive

R = Resistant

DISCUSSION

Individuals are at equilibrium with their skin flora as a result of the special properties of the skin, which does not allow an overgrowth of the organisms or survival of transient flora (21). The tissues under the skin are not usually invaded unless there is a breach in the skin or a diminution of the immune capabilities of the patient and the presence in adequate numbers of virulent organisms. Some of these situations are rife during surgery thus the need for appropriate preoperative skin preparation with antiseptic lotions. This has been shown to have

an effect on skin flora as well as the surgical outcome (22).

It is not surprising that the preponderant organism isolated was *Staphylococcus epidermidis* because it is known to be a usual skin commensal and most often non-pathogenic (23). *Escherichia coli* was cultured in only 6 patients all of whom had been on admission for more than 2 weeks. Three of these patients were on catheters for urinary drainage. These were probably acquired hospital flora or as a result of catheter use. It has been noted that long hospital stay as well as use of urinary catheter or perineal lesions are associated with flora change (1,24). The 3 subjects whose "Swab I" yielded no growth were all young ladies. This may be due to the nature of the soap used or the cream which they applied to their skin. It has been noted that certain skin applications destroy the skin flora (25). All the isolates were sensitive to the cleaning lotions except one (0.6%), which was resistant to only chlorhexidine while sensitive to chlorhexidine/cetrimide. This organism was *E.coli* isolated from a patient who had spent over one month in the ward with urinary catheter. This is probably hospital acquired flora which had been noted to be resistant to some cleaning agents and antibiotics (16,17,26). Growth of some gram negative organism in antiseptic lotions has also been documented (16).

The cleaning lotions were effective in clearing the flora as shown in "Swab II" where no organism was recovered in any of the patients including the *E.coli* that was resistant to chlorhexidine in "Swab I". This confirms the effectiveness of these cleaning lotions in our patients.

We conclude, therefore, that the antiseptic lotions [chlorhexidine (Clintane)] and chlorhexidine/cetrimide [Purit] used at Nnamdi Azikiwe University Teaching Hospital, Nnewi are still very effective against the usual bacterial skin flora among patients and clinical staff of the hospital.

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