

Evaluation of two methods of preoperative hair removal and their relationship to postoperative wound infection

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Abstract

Introduction: When a surgical operation is to be conducted through a hair bearing part of the body, hair removal is often performed. This study aimed to evaluate the relationship of two methods of preoperative hair removal to postoperative wound infection in a developing country where razor shaving is very popular.

Methodology: Consecutive consenting patients scheduled to have such operations were randomized into two groups. One group had hair removal by shaving with a razor blade while the other had hair removed by depilatory cream. Adequacy of hair removal and presence of skin injuries and/or reactions were noted preoperatively. Details of the procedures were recorded and patients were then assessed for postoperative wound infection.

Results: A total of 165 patients were studied. Of the 79 patients who had hair removal by depilatory cream, hair was completely removed in 70 (88.6%) compared to 53 (61.6%) of the 86 patients who had razor hair shaving ($p < 0.0001$). Skin injuries were noted in 24 (27.9%) of the razor group and 3 (3.8%) of patients who had depilatory cream, ($p = 0.001$). Thirteen patients (7.9%) had postoperative wound infection including 2 (2.5%) in the depilatory cream group and 11 (12.8%) of the razor group. A significant association was found between preoperative skin injuries and postoperative wound infections.

Conclusion: Preoperative hair removal with razor shaving predisposes to skin injuries which in turn significantly influence postoperative wound infection rates. Such injuries and resultant wound infection are fewer when depilatory cream is used for hair removal.

Key words: hair removal; postoperative wound infection; surgery

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Introduction

Postoperative wound infection may lead to significant morbidity, patient discomfort and increased cost of surgical care [1]. In the United Kingdom, it is estimated that postoperative wound infections cost the National Health Scheme about one billion pounds annually [2]. As part of the antiseptic steps taken to reduce postoperative wound infection, different methods of hair removal are employed when preparing patients for operations and many of these have been previously evaluated [3-5]. The most popular methods are the use of razor blade, clippers, and depilatory creams [6].

In many developing countries such as Nigeria, the age-long practice of preoperative razor shaving is still popular. However, studies reviewing hair shaving, the commonest and most economical method of hair removal, have noted its association with a greater risk of wound infection [3,7-8]. Furthermore, the psychological effect of hair removal on patients undergoing cranial surgeries has led to

doubts about the necessity of hair removal [4,9-14]. These among other reasons make the practice of hair removal controversial today with both proponents and opponents [3,7,14]. Those who advocate the practice of preoperative hair removal do so in the belief that presence of hairs can interfere with skin incisions and the subsequent closure as well as the application of adhesive drapes and wound dressings [15]. There has been no consistent agreement between the recommendations of different trials and review groups over the past few decades. A systematic review of several randomized controlled trials in the Cochrane Database, however, observed that if it is necessary to remove hair, then both clipping and depilatory cream result in fewer surgical site infections than shaving with a razor. It also advocated for more trials comparing hair removal with a razor with depilatory cream at different times and settings, among other factors [6].

At the Obafemi Awolowo University Teaching Hospitals Complex (OAUTHC), Ile-Ife, South-West

Nigeria, as in many tertiary institutions in the country, routine preoperative shaving to remove hair from the operative site and its surroundings, particularly when access would be through a hair-bearing area of the body, has been the practice. Patients for elective operations are usually shaved with a razor blade by nursing staff in the hospital on the morning of surgery. The authors of a pilot study undertaken at the OAUTHC in 2006 observed that approximately 4% of the clean general surgical cases developed postoperative wound infection. The infection rate in this category of wounds in the literature is reported to be about 1% [16]. The difference was striking and the need to bring down the infection rate at our institute stimulated our interest to study the relationship (if any) of preoperative hair removal with postoperative wound infection. The null hypothesis is that no difference exists in the adequacy of hair removal or development of post-operative infection between patients undergoing razor or depilatory cream for preoperative hair removal.

Methodology

A prospective study was conducted in the General Surgical Units of the OAUTHC, Ile-Ife, between August 2007 and July 2008. Clearance was obtained from the OAUTHC Ethics and Research Committee prior to commencement of the study. Consecutive patients who were to undergo clean operations with access through hair-bearing areas of the body were thereafter recruited after obtaining an informed consent. Subject information sheets and consent forms in the local Yoruba language were made available for the patients who could not read in English. Patients with history of jaundice, immunosuppressive disease, and those on preoperative antibiotics were excluded from the study. The patients were then randomized into two groups using a balloting method; *i.e.*, consecutive patients were asked to pick one of two sealed envelopes containing a folded paper on which one of the two methods was written. The first group had hair removal by depilatory cream on the morning of the operation by a nursing staff while the second group had razor shaving carried out on the morning of operation by the nursing staff in the routine manner. Shaving was performed in the theatre immediately before commencing the operation. VEET cream, whose active ingredient is potassium thioglycolate, was used for depilation in this study. Before commencement of the operation, a particular surgical

resident assessed the operative field for adequacy of hair removal, presence of skin injuries, erythema, rash, or other reactions and the findings recorded on an assessment form kept in a sealed envelope bearing only the patient's hospital number. The same resident, who assessed all the patients, was excluded from participating in the surgeries on these patients. The type of operation performed and its duration, type and length of anaesthesia, method of skin closure as well as the suture materials used were then recorded for each patient by the surgeon. Postoperatively, wounds were inspected by a senior resident who had not participated in the surgery on the third, fifth and seventh days. All patients were followed up for at least five weeks. A modification of the Southampton wound infection scoring system [17] was employed for grading infections when present. Grade I wound infection was taken as presence of undue wound redness and swelling, Grade II as discharge of serous or haemoserous fluids from the surgical wound, Grade III as discharge of pus from the wound, and Grade IV as discharge of pus and wound dehiscence.

Results

A total of 182 patients were recruited into the study. Seventeen patients, including ten in the razor group and seven in the depilatory group who missed some days in their follow-up clinic attendance, were excluded from the final analysis. Therefore, 165 patients comprising 127 males and 38 females with a mean age of 38.5 years and an age range of 16 to 79 years were studied further. Of these, 108 (65.5%) were young adults with the majority in the third and fourth decades of life. Eighty-six (52.1%) patients had hair removal by razor blade while 79 (47.9%) had cream depilation. Both groups were similar in socio-demographic characteristics and surgical procedures performed, the majority of which were open repair of abdominal wall hernias.

When both groups were considered together, the assessment of adequacy of hair removal, presence of skin injuries, and evidence of skin reactions observed on the operating table showed that 75% (123 of 165) had complete hair removal. Scanty hair remnants not necessitating further removal were present in 35 (21.2%) patients while the remaining seven (4.2%) patients had large hair clumps necessitating further removal. Further analysis showed that 11.4% (9 of 79) of the patients who had hair removal by depilatory cream had scanty hair remnants not necessitating further hair removal and none had

Table 1. Comparing efficacy of the two hair removal methods

Characteristics	Hair Removal method		Statistical Analysis
	<i>Cream</i>	<i>Razor</i>	
<u><i>Adequacy of Removal</i></u>			
Complete removal	70	53	$X^2 = 15.795$ $df = 1; p < 0.0001$
Incomplete removal	9	33	
<u><i>Skin injuries from procedure</i></u>			
No injury	76	63	$X^2 = 16.333$ $df = 1; p < 0.0001$
Injury(ies) present	3	23	
<u><i>Skin reactions from procedure</i></u>			
No reaction	76	84	$X^2 = 0.304$ $df = 1; p = 0.582$
Reaction(s) present	3	2	

large hair remnants. On the other hand, 61.6% (53 of 86) patients who had razor hair shaving had complete hair removal and 26 (30.2%) others had scanty hair remnants. Seven (8.1%) patients, however, had large hair remnants necessitating further removal. This difference was statistically significant ($X^2 = 15.795$, $df=1$, $p < 0.0001$) (Table 1).

Considering both groups together, evaluation of presence and grade of skin injuries and skin reactions showed no injuries at all in the majority (83.4%; 138 of 165) of patients, tiny single injuries in 10% (16 of 165); multiple small injuries in 6% (9 of 165); and large skin injuries in 1% (2 of 165) in the areas where hairs were removed. Of the 79 patients who had cream depilation, the majority (76; 96.2%) had no skin injuries, two (2.5%) had single tiny injuries, and only one (1.3%) had multiple small injuries. In contrast, of the 86 patients who had razor shaving, 62 (72.1%) had no skin injuries, 14 (16.3%) had single tiny injuries, eight (9.3%) had multiple small injuries, while two (2.3%) had large injuries. This difference was demonstrated to be statistically significant ($p < 0.0001$) Table 1). In terms of the skin reactions, there were none in 97% (160 of 165) of the patients when both groups were taken together. In those who had cream depilation, 96% (76 of 79) had no skin reaction. Similarly, 84 of the 86 (98%) of patients who had razor shaving had no skin reaction. The findings indicated that skin sensitivity and reactions were about the same for the two methods of hair removal.

There were 13 cases of postoperative wound infection, putting the infection rate of this study at 8%. The infections occurred in two patients (2.5%) in the depilatory cream group and 11 (12.8%) in the razor shaving group (Table 2). A statistically significant association was demonstrated between the

method of preoperative hair removal and the development of postoperative wound infection ($p = 0.015$). When the wound infections in both groups were classified, three (23.1%) were in grade I, eight (61.5%) in grade II, and two (15.4%) in grade III. There was a strong association ($p < 0.0001$) between the development of postoperative wound infection and the presence and degrees of preoperative skin injuries from the hair removal agents. Microscopy, culture, and sensitivity of wound swabs taken from the ten patients who had grades II and III injuries yielded no growth in two patients after at least 72 hours of incubation, while culture yielded growth of *Staphylococcus aureus* in five patients, *Escherichia coli* in two, and *Pseudomonas aeruginosa* in one patient.

Discussion

Most surgeons who practice preoperative hair removal do so to avert interference of hairs with skin incisions and subsequent closure; to discourage hairs from falling into wounds; to prevent interference with the application of adhesive drapes and wound dressings; and to prevent patients from experiencing severe pain on removal of adhesive dressings [15]. Hence the selection of hair removal method would in part be based on its effectiveness in completely removing hairs. The findings in this study show that cream depilation achieved better complete hair removal in more cases than shaving with a razor blade (88.6% versus 61.6% $p < 0.0001$). This finding compared favorably with reports of previous studies [18,19]. In one of the earliest studies on the use of depilatory cream for preoperative hair removal, Prigot and colleagues reported excellent hair removal in 89.5% of the cases [19]. In the current series, there was a period of learning curve in the application and

Table 2. Characteristics of patients who developed postoperative wound infection

<i>Patient</i>	<i>Infection Grade</i>	<i>Hair removal method</i>	<i>Degree of skin injury</i>
A	I	Razor	No injury
B	I	Razor	Large injury
C	I	Cream	No injury
D	II	Razor	Single tiny injury
E	II	Cream	No injury
F	II	Razor	No injury
G	II	Razor	Multiple small injuries
H	II	Razor	Multiple small injuries
I	II	Razor	No injury
J	II	Razor	Single tiny injury
K	II	Razor	No injury
L	III	Razor	Multiple small injuries
M	III	Razor	Multiple small injuries

use of the cream by the nurses as indicated by improvement in the completeness of hair removal after the first month of its use. This observation emphasizes the need for preliminary training of personnel involved in the use of the cream for hair depilation in order to assure its maximum benefit for complete hair removal.

The findings of some earlier studies did not justify the use of preoperative hair removal because the conventional preoperative shave was often associated with epidermal injuries and predisposed the patient to wound infection by causing the normal skin flora to contaminate the operative field [3-5,7,20]. In this study, more than one-quarter (27.9%) of the shaved patients had skin injuries of various degrees which is much higher when compared to the 3.8% of those who had depilatory cream application for hair removal. In a previous study, Seropian *et al.* recorded 16.1% skin injuries after razor shaving [18]. It is generally known that skin injuries following razor shaving may be influenced by the skill of the personnel but many studies have shown that even skillful shaving may inflict injuries, especially in body crevices, over scars and different skin conditions, and in an anxious patient [18,19,21]. However, none of the previous studies cited examined the relationship between skin injuries during preoperative hair removal and the development of postoperative wound infection. This study demonstrated an association between skin injuries and postoperative wound infection. Of the 26 patients who had injuries from preoperative hair removal, seven (26.9%) developed postoperative wound infection (Table 2). This number is high compared to the six patients (4.3%) who developed

postoperative wound infection among the 136 who had no injuries from preoperative hair removal. This finding was statistically significant ($p < 0.0001$) and it may be inferred that preoperative skin injuries inflicted by razor shaving possibly predisposes the patient to postoperative wound infection.

At the commencement of this study, nurses were apprehensive of extensive chemical reactions to the depilatory agent in patients. It is therefore worth noting that only three of 79 (3.8%) patients had skin reactions following the use of depilatory cream. Apart from one occasion when a patient developed marked erythema with rashes because the nurse inadvertently left the cream for much longer than the specified period of time for hair removal and another instance when a different nurse waited until the patient complained of feeling a peppery sensation before cleaning off the cream, there were no serious incidents. Indeed, no statistically significant difference between the development of skin reaction and the method of hair removal was demonstrated ($p = 0.576$). The experience in this study was, therefore, in keeping with the findings of previous studies using depilatory cream for preoperative hair removal [5,18].

The proportion of patients who had postoperative wound infection differed in the two subsets of patients in this study. While 2.5% of patients who had hair removal by depilatory cream developed postoperative wound infection, the infection rate of 12.8% observed among patients who had razor shaving was five-fold higher. This difference was also found to be statistically significant ($p = 0.015$). In some previous studies, findings similar to this were reported [8,18]. For instance, Seropian and

Reynolds found an infection rate of 5.6% in patients who had razor shaving compared to 0.6% after depilatory cream application [18]. Similarly, Court-Brown reported an infection rate of 10.4% in patients who had razor shaving preoperatively as against 3.9% following cream depilation [8]. This pattern was corroborated by a meta-analysis of seven randomized controlled studies comparing razor shaving to cream depilation in the Cochrane Database Systematic Review by Tanner *et al.* [6]. In pooling 1,420 patients from the seven studies, the review found a surgical site infection (SSI) rate of 10% among the razor-shaved patients compared to 7% among those who had depilatory cream application. However, no statistically significant association was demonstrated in the meta-analysis. It was therefore suggested that though depilatory cream reduces the proportion of patients who would develop postoperative wound infection, other endogenous and exogenous factors in and around the patients may also contribute significantly to the development of wound infection alongside the method of hair removal employed preoperatively. Some of these factors are the subjects of ongoing trials [22-26].

This study also demonstrated additional benefits of hair removal by depilatory cream. Hair removal with depilatory cream was adequately done with much reduced incidence of skin injuries and skin reactions and the higher postoperative wound infections rate which accompany skin injuries inflicted by razor shaving may hence be minimized by the use of depilatory creams.

A study involving a larger population including a wider range of patients and types of operations necessary to remove the influence of other endogenous and exogenous factors on the development of wound infection would enable a more extensive and detailed comparison of hair removal by depilatory cream and razor shaving.

Conclusion

This study demonstrates that postoperative wound infection is strongly associated with the presence and degree of skin injuries inflicted during preoperative hair removal commonly after shaving. It also shows that depilatory cream is superior to razor shaving for preoperative hair removal in our setting. We recommend larger population, multicenter, randomized controlled studies to further investigate the relationship of postoperative wound infection to the method of preoperative hair removal observed in this study.

Disclosure

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