



Effects of a modified preoperative shave technique on the incidence on Pseudofolliculitis Pubis
by R Beastrom

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF NURSING
Montana State University

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Abstract:

The problem of this study was to determine the effect of a modified, preoperative shave technique on the postoperative incidence of pseudofolliculitis pubis when compared with the routine, close shave technique.

The author reviewed the charts and interviewed a consenting, elective surgical population at a Montana hospital which required a total pubic shave. The sample consisted of nine females and eight males who ranged in age from twenty-nine to eight-three years of age. The population was Caucasian, nourished, and free of subjection to radiation, specific drugs and certain chronic illnesses during a standardized period of time.

Each subject was used as his own control receiving a modified shave on the left side of the pubic area and a close shave on the right side.

The two shaved areas were examined equally for the presence of papules and pustules by use of a standardized plastic card to delimit the area that had two windows cut out of it which were identical in size.

The data were subjected to application of a one-factor, analysis of variance with a two-way classification and significance was determined at the .05 level.

It was found that there were significantly fewer incidences of pseudofolliculitis pubis under conditions of the modified shave as compared to the close shave.

The following recommendations were made: 1) That further study would increase the number of subjects to a minimum of thirty.

2) That replication be done using exclusively black, male subjects.

3) That replication be done using equal-sized groups' of subjects of different races.

4) That replication be done using equal numbers of male and female subjects.

5) That further study be done using only subjects under fifty years of age.

6) That a different study be done to determine a correlation between pseudofolliculitis pubis and postoperative wound infection.

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EFFECTS OF A MODIFIED PREOPERATIVE SHAVE TECHNIQUE
ON THE INCIDENCE OF PSEUDOFOLLICULITIS PUBIS

by

RICHARD ALLEN BEASTROM

A thesis submitted in partial fulfillment
of the requirements for the degree

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Approved:

Anna M. Sherman
Chairperson, Graduate Committee

Anna M. Sherman
Head, Major Department

Henry L. Parsons
Graduate Dean

MONTANA STATE UNIVERSITY
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ABSTRACT

The problem of this study was to determine the effect of a modified, preoperative shave technique on the postoperative incidence of pseudofolliculitis pubis when compared with the routine, close shave technique.

The author reviewed the charts and interviewed a consenting, elective surgical population at a Montana hospital which required a total pubic shave. The sample consisted of nine females and eight males who ranged in age from twenty-nine to eight-three years of age. The population was caucasian, nourished, and free of subjection to radiation, specific drugs and certain chronic illnesses during a standardized period of time.

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The two shaved areas were examined equally for the presence of papules and pustules by use of a standardized plastic card to delimit the area that had two windows cut out of it which were identical in size.

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Chapter 1

INTRODUCTION

Preparation of the patient's skin for surgery is a nursing responsibility in the preoperative period of care. The purpose of this preparation is "to cleanse the skin and reduce the number of organisms on the skin so as to eliminate as much as possible the transference of such organisms into the incision site." (Brunner, 1975:45) In order to accomplish this goal, nurses use the technique of removing body hair from the site of operational incision as well as a buffer area of skin which is near and around that area and may be described as the surgical field. The problem arises in determining the most effective means of shaving hair from these areas or, stated differently, what technique will satisfy these criteria: 1) that hair will not pose an obstruction to opening or closing the skin by surgical instrumentation, 2) that the skin may be adequately disinfected for clean opening and closing, and 3) that complications which could result from the shaving technique used are eliminated.

It was probably after the work of Lister that the first understanding of antiseptics in surgery was clearly stated. At that time the practice of shaving the area of incision was at least supported by Lister's work on antiseptics, yet it is difficult to determine from the literature exactly when shaving actually began. It would

seem probable that shaving began when incisions themselves were initiated over areas of the body which harbored a thick bed of hair for the simple reason that shaving would increase the ability of the surgeon to view the field. As researched by Linton (1974b:39), "hair attracts particles because of its static charge." It therefore appears that shaving the operation site is a valuable procedure in order to remove the hair which captures bacteria. These bacteria consist of resident flora of the skin but also transient pathogenic organisms. Evidence that outbreaks of wound infection associated with hair carriers of pathogenic bacteria seem to support the practice of shaving hair, at least near the operative site. (Dineen and Drusin, 1973:1159)

At the present time the most common technique in preoperative shaving is to remove the hair entirely down to the skin surface, thus, eliminating it as an obstruction and exposing the skin to the action of an antiseptic solution prior to the operation. Although this method may fulfill the first two mentioned criteria as an effective way of removing body hair before surgery, there is a question whether the method is correlated to the incidence of a dermatological problem found in people who shave too closely. If this technique were to lead to complications (inflammation or infection of the hair follicle) which could cause the transfer of an infection to the surgical wound, then it should be evaluated with respect to the care and safety of

the patient.

The mechanism by which the close shave causes disease is understood by reviewing the structure of the hair as it grows out of the skin. "Each hair erupts at an angle to the surface so that a regional slant or 'hair stream' is produced." (Marples, 1965:49) Craig (1955:11) found that in the process of shaving it is common practice to stretch the skin so that the follicle mound is flattened and the hair is brought to a more elevated position in relation to the skin surface, thus allowing for a closer shave. Also, with the hair erect and the razor's edge being pulled across the skin at an angle to this, the tiny stubble left will have a sharp pointed end. Once the tension on the skin is released, the cut end actually retracts below the normal surface of the skin as the follicle mound is reformed. "The sharp end of the hair may then be pointed sideways and as it regrows it thrusts horizontally into the skin instead of up and out of the follicle orifice." (Blackwell, 1977:172) It is also possible for the hair to emerge from the skin, often almost parallel to the skin, and turn in the direction of the epidermis to form an arc with re-entry penetration into the skin as if to complete a full circle.

Only short stiff hairs can penetrate the epidermis, longer hairs, such as on the scalp, just bend. As the ingrowing tip proceeds into the dermis, epithelial cells form about the invading shaft and form a so-called pseudofollicle. An inflammatory reaction and neutrophilic foreign body response about the ingrowing hair produced a papule, and secondary infection, a postule. (Draper, 1976:566)

Typically this disorder is found in black men who shave regularly about their face and neck. The anatomical characteristic on which the disease depends; a strongly curved hair which emerges briefly almost parallel to the skin surface and shortly re-enters the skin to form an ingrown hair, is a strong racial characteristic of the negro and is especially predominant in the submandibular region. (Strauss and Kligman, 1956:533-535).

Strauss and Kligman (1956:533) described and named this condition pseudofolliculitis of the beard (pseudofolliculitis barbae). Most of the literature describes the disease as such but there are reports of formation of pseudofollicles in other anatomical areas of the body. Dilaimy (1976:507) sited a case of pseudofolliculitis of the legs in which a nineteen year old Iraqi girl had reported a rash on her legs which she had since beginning the practice of plucking the hairs to remove them (four years). Although shaving was not the technique used for hair removal and plucking the hair caused the free end to coil rather than have a sharp tip, the pathogenesis of the ingrown hair was identical to that of the shaved hair. Pseudofolliculitis pubis or pseudofolliculitis of the pubic area was found in a case of a black woman who began the practice of shaving her pubic hair in order to accommodate wearing a bikini bathing suit. (Alexander 1974:729) The development of pseudofolliculitis in a pubic area that has been shaved should not be totally surprising.

Indeed, the hair covering this area in many blacks (men and women) like the beard hair in black men tends to be very curly or kinky. In addition, this hair tends to grow in several directions as does beard hair. These common visible characteristics would suggest that pubic follicles in blacks (and others predisposed to pseudofolliculitis) are curved like those of the beard area. Consequently, it is reasonable to assume that if the pubic area were regularly shaved by larger segments of the susceptible population, there would be more persons seeking therapy for pseudofolliculitis pubis. (Alexander, 1974:730)

The practice of close shaving peroperative patients in readiness for surgery appears to risk the occurrence of pseudofolliculitis in areas of the body where coarse, curly hair is present. Although the literature relates to the incidence of pseudofolliculitis being a disorder common to people of the black race, it is the characteristics of hair which predisposes one to the disease. Strauss and Kligman (1956:535) stated that it was not a disease found only in blacks but, "the same hair features, to a lesser degree, characterized the ingrown hairs of three caucasians under observation with diminutive signs of this disorder." It is feasible to project that any caucasian or negro patient who suffers a very close shave of the public area may be susceptible to formation of pseudofolliculitis. Further logic would indicate that with the increase of an inflammatory response and infection in the area around an operative incision, the chance of transferring bacteria to the incision is greatly increased and the incidence of postoperative wound infection is higher than when this condition is absent. In order that all criteria for

safe preparation of the patient's skin for surgery are met, the technique of close shaving will be studied with respect to the incidence of pseudofolliculitis.

Statement of the Problem

The purpose of this study was to compare close shaving and modified shaving techniques in relation to the incidence of papule and pustule formation which are common to the condition known as pseudofolliculitis.

Hypotheses

H_0 = There will be no difference in the incidence of pseudofolliculitis pubis under conditions of the modified shave as compared with the close shave.

H_1 = There will be significantly fewer incidences of pseudofolliculitis pubis under conditions of the modified shave as compared with the close shave.

Definitions

Papule - A solid, circumscribed, elevated, superficial, reddened or normal colored lesion of the skin up to one centimeter in its longest diameter (similar to a small pimple).

Pustule - Variable in size, circumscribed, elevated, superficial lesion which contains pus (commonly referred to as a white-head).

Pseudofolliculitis Pubis - Inflammation and/or infection of the hair follicle due to penetration of the skin by the shaft of the shaved pubic hair that results in papule or pustule formation.

Close Shave - Removal of hair without a minimal wait of four minutes in duration in order for the hair to absorb the lathering solution, with application of traction on the skin in the opposite direction of the grain of the hair, and with the shaved surface free of razor stubble. Slight downward pressure is exerted on the razor while shaving and repeated strokes of the razor are used over the same area to facilitate removal of loose hairs.

Modified Shave - Hair removal with a four minute duration of soaking, without any skin traction, and with a visible hair stubble of one to three millimeters remaining above the skin surface. No downward pressure is exerted on the razor while shaving and repeated strokes of the razor to remove loose hairs are not used.

Chapter 2

REVIEW OF LITERATURE

Shaving of the operative site prior to surgery is a procedure which has a long history. McPhedran (1977:195) states: "The origin of the practice of shaving the operative site is unknown, but the practice is almost universal." Most authors presumed that shaving began at the beginning of this century, after Lister's work on antiseptics and the introduction of carbolic acid for disinfecting the skin for surgery (Linton, 1974a:33; MacClelland, 1975:55; and Seropian and Reynolds, 1971:251).

There are two reasons for the practice of shaving the surgical area. A logical reason would be exposure of the site for incision. McPhedran (1977:196) indicated that surgeons find, "the unshaven operative area visually offensive" and MacClelland (1975:59-60) questioned whether hair removal was necessary, "for visibility and convenience of the surgeon." It would seem easier to incise skin which was bare than skin which was covered with hair. But this reason is only academic compared to the second and most important one. "Hair attracts particles because of its static charge. It should therefore be washed before operation and most surgeons shave the area to be incised, some prefer clipping". (Linton, 1974b:38) Dineen and Drusin (1973:1159) found that, "everybody carries bacteria

in varying amounts in their hair, and in many instances large numbers of organisms are of a virulent type."

Hair has the ability to attract airborne bacteria as well as support its own normal flora. The transient organisms could theoretically be any which are transferred to the hair from the air or by touch from a contaminated source. The possibilities of different organisms being on the hair are enormous but the most common hair-carried pathogen related to postoperative wound infections is the penicillin-resistant Staphylococcus aureus. (Dineen and Drusin, 1973:1157 and Linton, 1974a:34). The normal flora of the hair is identical to that of the skin and while these bacteria reside uneventfully in the desquamating layers of the skin, on the hair, and in the invaginations of the hair follicles and other glandular openings of the skin, they can become pathogenic when introduced to other tissues of the body. (Kligman, 1965:19 and Strauss and Kligman, 1956:535-536) With the removal of the hair, the accessibility to the skin for adequate cleansing of organisms is more effective, in addition, it is easier to view the operative site.

It has been argued that shaving the hair may be causing more harm than good in reducing the number of bacteria on the skin. (MacClelland, 1975:57) The basis for this argument is stated by Seropian and Reynolds: (1971:251)

Razor injuries potentially liberate the resident flora to the operative field and provide access and substrate for transient organisms. Moreover, it is not necessary to have visible injuries. Even a skillful razor preparation causes microscopic injuries that provide portals of exit and entry, with the injured tissue serving as a substrate for bacterial growth.

One study compared infection rates of clean wounds and found a 2.3 percent infection rate in patients that had been shaved and only 0.9 percent in patients that had no shave or clipping. (Cruse and Foord, 1973:207) While the number of wounds studied was impressive (23,649), the description of the populations of the shaved and unshaved patients is absent from the study. Without criteria for assignment to either of these groups the validity of their results is questionable.

To examine the theoretical basis for an increase in bacterial growth with shaving one must also question the logic of the normal disinfectant process of the skin. The most superficial layer of skin, the epidermis, is ecologically the most important.

The stratum corneum, which is the most superficial part of the epidermis, consists of several layers of very much flattened dead cells firmly attached to each other and containing homogenous horny masses of keratin. The most superficial cells of the stratum corneum are constantly shed, normally as minute particles, but in certain pathological conditions as visible flakes and sheets. This loss is made up by constant replacement from below, so that the layers of which the epidermis is composed consists of cells moving up towards the surface and in successive stages of differentiation and death until they are finally lost to the environment. (Marples, 1965:9-10)

This normal process of growth occurs not only on the

surface of the skin but also in the ducts of the glands and in the hair follicles. Each anatomic area of the skin has its characteristic representation of glands of one kind or another. (Walter, 1955:75)

Montagna (1962:100) states:

The cutaneous surface is coated with a complex layer of lipids and organic salts, liberated by the keratinizing cells and secreted by the sebaceous and sweat glands. This layer, which has a pH of 4.5 to 6.0, is called the "acid mantle", and is said to have antifungal and antibacterial properties.

The accusation made by Seropian and Reynolds (1971:251) that the razor is a liberator of normal flora to the operative field is contradictory when considering that the skin, through its own maturational process, disinfects itself by a natural mechanical purge of resident organisms to the surface. Obviously a cut through all five layers of epidermis, which exposes the dermal tissue, will liberate substrate for transient organisms and normal flora to invade but these represent the classic nicks and cuts of close shaving. When properly executed, a shave is capable of avoiding penetration into the dermis. Shaving removes hair and also much of the desquamating epithelium. Hamilton et al (1977:269), examining safety factors of hair removal, found: "Direct observation showed that the safety razor often caused gross cuts." One might expect those results when the shave used was not only a close removal technique but performed without the benefit of a lubricating detergent solution (dry shave). Skin biopsies of these subjects were examined

with a scanning electron microscope which revealed that, "the razor caused multiple slices perpendicular to the line of progress of the blade." (Hamilton et al, 1977:270) Yet, within the same study they state: "Stained sections of biopsies examined with a light microscope appeared normal when hair had been removed with a razor" and, "The epithelium was intact and covered with a thin layer of keratin." The use of shaving for hair removal should not be held responsible for the shortcomings of a poor technique that has damaged the patient's first line of defense. Rather, it is important to improve the methods of shaving before abandoning it as a poor practice.

The historical practice of shaving the hair down to the level of the skin surface has other negative effects in addition to penetration of the blade into the dermal layer. Hair itself can act like a needle and grow into the epidermis when cut a certain way.

In the process of shaving it is common practice to stretch the skin so that the follicle mound is flattened and the hair is brought to a more elevated position in relation to the skin surface, thus allowing for a closer shave. (Craig, 1955:11)

Craig (1955:11) goes on to say: "If the hair is shaved in the direction of the grain the hair tends to be flattened just prior to shaving." Shaving with a stretched skin can cut the hair so close that when the tension is released, the cut end is actually below the normal surface of the skin. Blackwell (1977:172) also found that, "enough pressure by the razor at the follicle's aperture will cut the hair slightly below the surface level." Dilaimy (1976:507) reports:

"If the skin is stretched to get a closer shave, the free end of the hair will spring below the surface of the skin when the pressure is released."

The sharpness of the tip is evident considering the angle of the blade against the hair when it is cut.

Moreover, those hairs that are cut must, of necessity, in view of their emerging practically parallel with the skin surface, be cut obliquely, producing a sharp pointed tip which doubtlessly facilitates penetration into the skin. (Strauss and Kligman, 1956:535)

Alexander (1974:730) and others (Blackwell, 1977:172 and Dilaimy, 1976:507) agree that the sharp point to the hair after shaving promotes entry of the hair into the epidermal layer. It is then the natural growth of the hair which adds the final step towards a disease condition.

Draper (1976:564-566), in a chapter concerning this condition's etiology writes:

As the shaved curved whiskers emerge from the skin, and often almost parallel to the skin, they turn in the direction of the epidermis and form an arc with re-entry penetration into the skin as if to complete a full circle. Less frequently, the sharp tips penetrate the epithelium of the distal portion of the follicle just beneath the surface and arc downward without ever becoming externalized. When the whisker is externalized, the external portion from exit to re-entry is usually short, averaging two millimeters in length. As the ingrowing tip proceeds into the dermis epithelial cells form about the invading shaft and form a so-called pseudofollicle. If these hairs are allowed to grow, the skin is penetrated up to two or three millimeters and then resistance increases and penetration ceases.

Although he is describing the condition found in one particular

anatomical area of the body, the beard, the pathophysiology of hair entering the dermis is feasible anywhere a close shave is performed on hair which is capable of curling and penetrating the epidermis.

Pseudofolliculitis of the beard or pseudofolliculitis barbae, as named by Strauss and Kligman (1956:533), is the most common form of the disease found in the literature. (Alexander and Delph, 1974: 459-464, 479; Blackwell, 1977:172-173; Cirincione, 1962:388-389; and Draper, 1976:563-573) Dilaimy (1976:507) reported pseudofolliculitis occurring on the legs of one of his patients who plucked the hair rather than shaved it, and Alexander (1974:729) saw the disorder on the pubic area of his patient as a result of shaving that area. All the authors discussing any form of pseudofolliculitis were in agreement that the most frequent incidence of pseudofolliculitis was in men of the negro race who shaved their face. Cirincione (1962:388) and others (Alexander and Delph, 1974:459; Craig, 1955:12; and Strauss and Kligman, 1956:533-534) attribute this to the natural kinkiness and coarseness of the hair of this race of people which aids in the ability of the hair to penetrate the skin. Draper (1976:566) clarifies: "Only short stiff hairs can penetrate the epidermis, longer hairs, such as on the scalp, just bend." The requirements for formation of pseudofolliculitis are: sharp shaved hair that lies below the skin line, sharp point on the hair end, stiff hair and curly hair. These criteria do not apply only to black men who shave

their face. There are several references to the disorder being found in the caucasian population (Dilaimy, 1976:507; Draper, 1976:563; and Strauss and Kligman, 1956:535). Alexander and Delph (1974:460) deducted that, "it would appear that the tendency to develop ingrown hairs after regular shaving is a genetic rather than a racial characteristic." Also, women are not excluded from getting pseudofolliculitis as three authors (Alexander, 1974:729-730; Blackwell, 1977:172; and Dilaimy, 1976:507) discussed their observations of the presence of this disease in women.

Putting all available information together, it is clear that pseudofolliculitis knows no sexual or anatomical bounds. It is a disorder that can develop in any person who is genetically predisposed. Regular shaving is the stimulus that precipitates the condition. (Alexander, 1974:730)

The result of the ingrown hair is generally found to be the same. As the hair enters the skin it carries its normal bacteria with it, through the cleansing layers of the epidermis and into the dermal tissue. (Strauss and Kligman, 1956:537). Cirincione (1962:388) notes: "The characteristic lesions are erythematous firm papules containing burried hair." Blackwell (1977:173) suggests that the temporary skin elevation, which is either normal in color or erythematous, is due to the hair underneath trying to emerge from the follicle.

An inflamatory reaction and neutrophilic foreign body response about the ingrowing hair produces a papule, and a secondary infection a pustule. Microscopic examination and

bacterial culture reveals resident cocci to be the organisms involved. (Draper, 1976:566)

These lesions are small in relation to the size of the body and would seem to pose no problem to a healthy individual other than uncomfortable itching and, from an aesthetic point of view, unsightly blemishes. Alexander and Delph (1974:460) states the treatment, "has been demonstrated that by allowing the beard to grow, the hairs are ultimately freed from their pseudofollicles by a combination of physical forces that result in the upward movement of the hair." It seems like a simple solution to the problem of pseudofolliculitis, yet an infection near the area of an operative wound is an unwanted risk, no matter how insignificant it seems at the time. The importance of reducing pseudofolliculitis which occurs in the area of incision because of a close preoperative shave has not been identified and a modification in shaving which leaves the hair above the skin surface and with a blunt end appears to be a logical approach to the problem.

It is essential that factors which affect hair growth be controlled due to the dependence of pseudofolliculitis on a specific sort of healthy hair. Pubic hair possesses characteristics which are required in formation of pseudofollicles. Marples (1965:56) describes pubic hair as, "coarse, irregular and asymmetrical cross section with many constrictions and twists, usually curved but may be

straight or spiral-tufted." The simulation of pubic hair to grow in this manner is initiated at puberty due to sex hormones (Marples, 1965:46, 61). "Coarse hair is found in the scalp, eyebrows, eyelashes, and the pubic and axillary regions in both sexes." Although Tring (1976:1938) found sexual differences in the amount and distribution of body hair the development of the characteristic pubic hair at puberty were obviously dependent upon sex hormones in men and women.

Differences of hair in caucasian and Japanese races has been researched and reported in Marples. (1965:61-63) The number of hair per unit area in the bearded area differed from two to two and a half times as much in caucasian males in comparison to Japanese males. The axillary hair of both sexes of caucasian subjects also revealed the phenomenon of more hair per unit area than both sexes of the Japanese subjects as well as both caucasian sexes producing more hair by growth than both Japanese sexes. The similarity of beard and axillary hair to pubic hair, because of the sexual characteristics they possess, justifies equal assumption of these differences being prevalent in the pubic region of Japanese subjects. Information on the characteristics of hair in other oriental and American Indian races was not obtainable from the literature, but similarities of hair characteristics was suspected in these groups.

Hair changes with the advance of age. Reynolds (1951:576-584)

studied over three hundred subjects from their birth to twenty-one years of age and his results showed one hundred percent of the subjects had mature pubic hair at age eighteen. In older age, Melick and Taft (1959:1597-1607) discovered that one fifth of the male population (167) and one third of the female population (189) that were examined had detectable loss of pubic hair. A study of the mean plasma testosterone level in relation to age revealed values of subjects in the seventh decade significantly below the mean value found in the twenty to fifty year old group (Vermeulen et al, 1972: 730-735). This exemplifies the influence that the sex hormone testosterone has on the formation of pubic hair at puberty and it's senescent changes in both sexes.

Nutritional factors play a part in hair growth. Hair is mainly composed of alpha keratin, a protein of a large number of amino acids. (Marples, 1965:190). As would be expected the growth process is sensitive to the quantity of protein in the diet. Bradfield et al (1967:438-439) deprived eight healthy men aged twenty-four to twenty-nine of protein for fifteen days and discovered severe atrophy of their hair bulbs. Blackburn, et al (1977:234), discussed the phenomenon of rapid weight loss with hair loss and determined that the low hair growth rate is a result of insufficient mobilized body protein and dietary protein rather than directly related to the rapid loss of weight. Sims (1968:235) felt that body weight was a poor

indicator in identification of malnutrition but the measurement of hair growth was more sensitive. Weight-for-age was a combined measurement devised by Bradfield and Jelliff (1970:283-284) which found subjects below eighty percent of their weight for their age to have reduction changes in their hair roots. A successful method of predicting malnutrition in subjects was used by McLaren and Read (1975:219-221) which considered the effect of age for the expected weight for length.

People undergoing radiation therapy are likely to have effects on their hair growth. Two different studies found marked abnormalities in the hair bulb and shaft above the bulb with routine radiation levels used in therapeutic treatment (Malkinson and Griem, 1965:755-799; and Van Scott and Reinertson, 1957:205-212). Progressive atrophy of the bulb took place with continued exposure and the hair shafts grew thin and undulated from these atrophic bulbs.

Certain drugs will exhibit an inhibitory action on hair growth. Estrogen, which is known to play a role in pubic hair development, can also lead to retardation of the hair cycle. (Ferriman, 1971:10) Birth control pills add estrogen to the normal system of the female and this may produce an adverse affect on the estrogen/testosterone balance. All cortisol drugs have an effect of inhibiting protein anabolism throughout the body and may indirectly retard hair growth. (Ferriman, 1971:10) Thyroxine plays an important role in hair

development. "Excess of thyroxine leads to acceleration of their (sheep) hair cycle and an increase of hair growth rate in rats, while production of hypothyroidism with propyl thiouracil has the adverse effect." (Ferriman, 1971:10) Anticarcinogenic agents have alkylating, antimetabolic and radioactive actions on the human body, all which interrupt normal cell metabolism and usually cause alopecia. (Goodman and Gilman, 1970:1353-1377)

Some diseases are linked with either unusual hair loss or interference of the hair cycle. Adrenal glands are responsible for hormone secretions which could affect the growth of hair. Steroids, which were mentioned above, are naturally produced in the glands. Their effects on protein anabolism are the same as the pharmacological steroids and any hypersecretion of this gland will have adverse effects on hair growth. Southren, et al (1965:518-525), studied three women with testicular feminization syndrome that had no pubic hair growth. Subsequent gonadectomy did not change testosterone levels after the operation and the adrenal cortex was given credit for producing significant quantities of testosterone in these women. On the basis of the varied hormones secreted by the adrenal glands and their different actions on the body, any disorder of the adrenals could possibly affect hair growth in a negative way. The study of Southren, et al, reinforces the idea that estrogen and testosterone balances are crucial to hair growth. Lynfield (1960:

323-327) found that pregnancy significantly slowed hair growth and, after delivery until four months post partum, there was an increased incidence of hair loss. Although testosterone is accepted as the essential compound for sexual hair growth in both sexes, it has been shown to retard the hair cycle in rats as has estrogen and this phenomenon is related to the general anabolic effect which testosterone has on cellular metabolism. (Ferriman, 1971:10)

Uncontrolled diabetics develop alopecia. Whether this is due to lack of insulin or the toxic effects of disturbed carbohydrate and fat metabolism could not be stated by Ferriman (1971:11).

A scar-producing condition such as systemic lupus erythematosus can cause alopecia. (Pillsbury, 1971:234)

(1967:46-48) correlated illnesses with reductions of hair diameters and found those that involved hemorrhage to have caused the most marked reductions.

The most obvious way that hemorrhage can be associated with the thinning of the hair shaft is by depletion of the pool of proteins and amino acids so that there is a reduction in the availability of amino acids for protein synthesis. Other ways that hemorrhage may produce this effect is by anemia and reduction in serum iron concentration.

Because of the function of the pituitary gland on the normal growth of the body, hypopituitaristic subjects would not display normal hair growth. (Ferriman, 1971:11)

Lesions of the midbrain and brain stem have been associated to

alopecia which is explained by a possible link to the thermal control in the hypothalamus that secretes a substance which favors shedding of the hair. (Ferriman, 1971:11) This may be related also to temporary loss of hair following acute febrile illnesses which are not controlled promptly. (Pillsbury, 1971:234)

The chance of general loss of hair due to allergic reactions to drugs, etc., are too numerous to mention but obviously will affect the results of the study. Alopecia, excluding the genetic form of hair loss (male baldness), will be another factor influencing normal hair growth that will determine the outcome of pseudofolliculitis.

Chapter 3

METHODOLOGY

Sample Selection

The subjects required to complete this study were selected between May 26, 1978, and July 14, 1978, from a surgical schedule based on criteria to control the effect of extraneous variables.

These criteria were:

Type of Preoperative Shave. Subjects undergoing an elective surgery which required complete shaving of the pubic region according to one Montana hospital's nursing procedure manual were accepted for study. The postpuberal development of hair which possesses secondary sex characteristics of coarseness and curliness is found in the pubic region. These characteristics of hair are prerequisites for the formation of ingrown hairs after shaving too close and, therefore, the pubic area was studied. The type of surgical procedures that required a total pubic shave included: retropubic repair, gastric resection, cholecystectomy, splenectomy, appendectomy, oophorectomy, abdominal hysterectomy, pelvic laparotomy, femoral-popliteal bypass graft and bilateral vein ligation.

Sex. Patients of either sex were satisfactory for the study. The characteristics of pubic hair in comparison with the sexes does not vary widely and the incidence of pseudofolliculitis was assumed

to be similar in men and women.

Race. The oriental race is known to have a low number of hairs per unit area where coarse hair is found. Because of many similarities between orientals and American Indians, Indians were also assumed to have a low number of hairs per unit area. Subjects of oriental or American Indian ancestry of half-blood (one parent was full-blood or both parents were half-blood), or more, were excluded from the study. All subjects in the study were of the caucasian race.

Age. Characteristics of mature hair depends on hormonal activity initiated at the adolescent stage of life (puberty). This process may last several years but at age eighteen, one hundred percent of the characteristics of adult pubic hair are present. Therefore, all subjects were greater than eighteen years of age.

Nutrition. The growth of normal hair is dependent on an adequate supply of nutrients in the diet, especially protein, as hair is mostly composed of protein. Malnourished individuals tend to have low body weights. Subjects weighing less than the predicted weight for their sex, age, and height according to the Metropolitan Life Insurance Company tables (1959) were excluded from the study.

Radiation Therapy. Electron and X-radiation are known to retard the normal growing events of the hair cell and ultimately cause changes in the thickness and consistency of the hair shaft. Persons having undergone any form of radiation therapy from two weeks before the

shave to the time of examination of the skin three days after the operation were excluded from study.

Drugs. Subjects taking specific medications which are known to affect the growth of hair were excluded from the study if they took them from the time of the shave to the time of the skin examination. These drugs included: steroids, thyroid antagonists, and anticarcinogenics. It is difficult to know the specific affects estrogen exhibits although it has been linked to changes in hair growth with too high and too low serum levels of estrogen in animals. Because oral contraceptives are believed to add estrogen to normal levels when used for birth control, women taking them were excluded from the study. Women undergoing surgery that removed estrogen-secreting glands, however, received maintenance doses of estrogen to counteract the hormonal imbalance resulting from removal of the ovaries. This form of supplemental estrogen therapy was not considered grounds for exclusion from the study.

Illness. Certain disease conditions or disorders of body function will negatively affect the growth of hair. Subjects that were known to have any of these conditions existing at the time of the shave were not included in the study. Also, if they demonstrated any of the following disorders during the period of the shave through the examination they were eliminated from the study. These conditions are categorized:

Endocrinologic.

- 1) Hypothyroidism or thyroidectomy without a controlled thyroid medication regimen.
- 2) Any disorder of the adrenal glands or adrenalectomy.
- 3) Juvenile onset diabetes mellitus.
- 4) Pregnancy including a four month period after term or abortion.
- 5) Testicular feminization syndrome without total oophorectomy.
- 6) Bilateral orchidectomy.

Immunologic. Systemic lupus erythematosus.

Hematologic.

- 1) Hemoglobin less than 12 gm/100 ml (male).
- 2) Hemoglobin less than 11 gm/100 ml (female).
- 3) Hematocrit less than 38 percent (male).
- 4) Hematocrit less than 36 percent (female).
- 5) Iron deficiency anemia.

Central nervous system.

- 1) Hypopituitarism.
- 2) Lesions of the midbrain or brain stem.

Febrile. Fever of more than 102° F for more than six hours.

Dermatologic.

- 1) Any skin disorder which causes retardation of hair growth.
- 2) Any form of non-hereditary alopecia.

The process of identification of possible candidates for study according to the above criteria was conducted in this manner:

One day prior to surgery the operation schedule at a hospital in Montana was reviewed by the investigator in order to determine the names of the patients which required a pubic shave for their operation.

Upon admission of these designated patients the charts were examined for information which would qualify the patient as a suitable candidate (see Appendix A).

The researcher then interviewed the patient giving an introduction, the purpose of the study, and a description of the techniques employed in the study.

Each patient was then asked if he would participate in the research study.

When the patient agreed to participate he was asked questions to further identify the required subject selection criteria (Appendix A).

A consent form (Appendix B) which stated the patient's awareness of the research as it involved him was signed by consenting, qualified subjects.

Procedures

The Shave Technique. The subjects were shaved the morning of

their operation between the hours of 5:30 a.m. and 8:00 a.m. Because of the initial visit with the patient to explain the purpose of the study and to obtain consent to be included in the study, the subjects had knowledge of the two shaving techniques that were used. However, to reinforce that knowledge and to help prepare the patient for the shave, a description of the techniques used and instructions for the shave were given.

The curtain around the bed was drawn for privacy. The patient was instructed to lie on waterproof pads, called linen savers, placed so that they were directly under the areas of the body that required shaving and protected the bed from getting wet from the lathering solution. The lathering solution was standard for each patient, contained in a pre-packaged shave kit. A rubber sponge which had a measured amount of pHisoHex was wetted in tap water taken from the faucet after running only the hot tap for ten seconds. This was felt to be a comfortable temperature for the patient and measurement of the temperature of the water by a thermometer in four rooms on the four different floors where shaves were done showed an approximate average temperature of 108° F.

The area of the body that was to be shaved was exposed and this area was determined by the type of operation the patient was having. An overhead light was turned on so that the person conducting the shave would have adequate light to view the field to be shaved.

The pHisoHex sponges were slowly and gently applied to the patient's skin so as not to startle him. Then, with slight pressure applied to the skin with the sponge, the entire area that was shaved was stroked repeatedly for one minute until a generous lather was worked up.

The Close Shave. The close shave technique was initiated immediately after the lathering was completed and that time was noted on the watch of the person shaving to begin timing for the soak required on the side of the modified shave. With a twin-headed disposable Lister safety razor the close shave was begun on the right side of the patient's midline. One side of the razor head was marked to identify it so each edge was used solely on one side of midline. The close shave was done in this manner:

The person shaving identified a hair approximately one centimeter from the midline on the right side and directly above the symphysis pubis. The shaver gently pulled the hair straight and determined the place where the hair shaft emerged from the follicle in order to carefully shave the hair off at the skin surface. The tip of the hair was marked with bright red fingernail polish and allowed to dry in order to differentiate that end from the shaved end. After it had dried it was safely put inside a standard test tube (150 mm long and 15 mm in diameter). The tube was capped and permanently marked with the appropriate patient number for later

identification and possible determination of the degree of curl and calibration of the diameter of the hair. This was done to explain the study's findings through analysis of an intervening variable (hair characteristics) in case there were no significant results.

The "grain" of the hair was identified and the razor pulled in that direction across the hair while moderate traction on the skin was applied in the opposite direction of the grain and a slight downward pressure was applied on the razor while shaving. Repetitive strokes with the razor helped remove loose hairs so that the skin was visualized more easily.

The hair was shaved down to the skin while traction was maintained so that it appeared that no hair stubble was left.

Once the entire right side was completely shaved in this manner it was blotted dry with a towel and covered with a bath blanket to help keep the patient warm while the other side was shaved.

The Modified Shave. The modified shaving technique was done on the left side of the patient's midline as such:

A minimum time of four minutes from the end of lathering occurred before starting the modified shave in order that the lather softened the hair before shaving.

The grain of the hair was determined and the unused edge of the razor was identified and used to shave in the direction of the

grain. This was done without any traction on the skin whatsoever and also without any downward pressure on the razor. There was care taken to hold the razor's handle between the fingers and the thumb so that the only downward pressure on the skin was from the weight of the razor. Removal of loose hairs from the skin was done by wiping the area with a dry paper towel which was available in the shave kit, rather than using repeated strokes with the razor.

The shave was conducted in this manner until there remained a tiny stubble of hair no less than one millimeter and no greater than three millimeters above the level of the skin over the entire left side of the shaved area. That side was then blotted dry with a towel and the patient was covered on both sides by the bath blanket.

A clean basin of clear warm water was then drawn and the total area that had come in contact with the pHisoHex solution was rinsed clean with a washcloth and dried with a towel. This bathing was to remove the soap film from the skin so there was no chance for irritation to the skin from dried soap. The linen savers under the subject were removed, the patient allowed to dress as before, the curtain was drawn back and the overhead light switched off to mark the end of the shave.

The methods of shaving were identical on all subjects. To insure the modesty of the patients the researcher shaved all male

subjects and all the female subjects were shaved by a female nursing assistant in surgery whose job responsibility was to conduct pre-operative shaves on the surgical female patients. She was instructed by the investigator on the procedures for the shave techniques.

The Examination. Three days after the shave, or on the third postoperative day, the pubic area of the male subjects was examined by the researcher and a male nursing student. Female subjects were examined by two female nursing students. The method of examination was done between 7:00 a.m. and 3:00 p.m. and followed these steps:

The patient was approached by the examiner who re-introduced the purpose of the exam and then gave instructions for the exam.

The curtain was drawn for privacy.

The subject exposed the pubic region for examination while laying flat in bed and an overhead light was switched on to facilitate observation of the skin.

A card made of X-ray film with two portions cut out of the middle was used to examine the specified areas on each patient (see Figure 1 on page 33). The dimensions of each cut out area was three centimeters at the base from midline moving laterally, then forming an obtuse angle upward to the top at a length of five and one half centimeters. Across the top to midline and parallel to the base, the

