The Role Of The Morphology And The Source Of Hair Follicle In Pilonidal Sinus Disease: Electron Microscopic Findings

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The Role Of The Morphology And The Source Of Hair Follicle In Pilonidal Sinus Disease: Electron Microscopic Findings

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Abstract

Introduction: Hair is the most commonly accepted etiological factor in pilonidal sinus disease. The aim of this study is to determine the morphological features and the source of the hair follicle took role in etiology of pilonidal sinus disease.

Methods: The study included 36 cases with pilonidal sinus disease and 36 healthy volunteers. Hair samples were taken from scalp, back and gluteal region. The hair follicles were evaluated by scanning electron microscope.

Results: There was no difference in between the groups in terms of demographic data. In group 1, the mean diameter of scalp, back and gluteal region hair were 53.4, 52.8 and 51.2 µm, respectively. There was no difference in hair diameter. In group 2 the mean diameter of scalp, back and gluteal region hair were also similar: 58.9, 45.6 and 46.4 µm, respectively. Moreover, the mean cuticle count was similar between the cases and the controls. When the cases were evaluates as being below or above 30 years of age, the hair morphology was found to be the same.

Conclusion: The hair causing the pilonidal sinus can be originated from any part of the body. It is not possible to determine the source of hair by scanning electron microscope. The relation between being hairy and the pilonidal disease can be explained by the web formation of hair in intergluteal sulcus. Therefore, the removal of hair in intergluteal sulcus can be affective for prevention of pilonidal disease.

KEYWORDS: pilonidal disease. hair morphology. scanning electron microscope
Introduction

Pilonidal disease is an inflammatory disorder seen in intergluteal sulcus and mostly affecting young men. It is seen in males 10 times more commonly than in females (1, 2, 3, 4). A pilonidal sinus is a pathological, epithelised tract that opens to the skin and contains hair follicles. The most common localization is the natal cleft (intergluteal sulcus), however it can be seen in umbilical or interdigital area (especially in barbers) (5). The etiology of the disease is controversial, but it commonly accepted as an acquired disorder. The main etiological factor is hair however, local features of the skin and the deepness of the natal cleft play important role (1-6, 7, 8). Although the hair is accepted as the main etiological factor, the role of morphological features and the source of the hair follicle has not been evaluated yet.

This study tries to answer the following questions;

1. Is it possible to determine the source of the hair follicle inside of the sinus (scalp, back or gluteal region)?
2. Are there any morphological differences between the hair follicles of people with pilonidal sinus disease compared to those without it?
3. Can the decrease of the incidence of pilonidal disease by age be explained by the change of hair follicles by age?

Materials and Methods

The study was performed after the permission from the ethical committee of Selçuk University Meram Medical School. There were 2 groups in the study. Group 1 consisted of 36 cases with pilonidal sinus disease and group 2 consisted of 36 healthy volunteers at the same age groups. In further evaluation, group 1 was divided into two subgroups according to age being below and above 30 years.

An informed consent form was signed by all the participants. Hair follicles were then taken from the scalp, back and the gluteal region. From each of these regions, 3 hair follicles were sampled by the same. Hair follicles were taken from; the occipital region for the scalp, the midline at the inferior tips of the scapula, and from the intergluteal sulcus at the level of 2 cm below the posterior superior spina iliaca. For the cases with pilonidal disease, hair follicle samples were also taken from inside of the sinus. The healthy volunteers were examined for pilonidal disease and those with present or previous pilonidal disease were excluded from the study.

The samples were examined by scanning electron microscopy (ZEISS EVO LS 10) (Filament: LaB6 [lantanium hexaborate] Cressington Auto 108 spuatter coater, gold plated). The pictures were saved at 1000 and 2000
magnifications. The diameter of the hair follicles, the cuticle numbers in the area of 10 µm long and the morphological features of the cuticles were evaluated by a blinded histologist. The morphological features of the follicle were compared.

The statistical analysis was performed by SPSS 15.0 for Windows. In the comparison of the mean diameters student t test was used. P value lower than 0.05 was accepted as statistically significant.

Results

In group 1 (cases), there were 12 females and 26 males between the ages of 18-45 years. The mean age was 23.5 ± 5.22 years. In group 2 (control), there were 11 females and 25 males between the ages of 18-46 years. The mean age was 23.6 ± 3.65 years. There was no statistically significant difference in between the groups in terms of demographic data.

In group 1 the mean diameter of the hair follicle from the scalp, back and gluteal region were 53.4, 52.8 and 51.2 µm, respectively. There was no difference in between the regions (p>0.05). The number of cuticles in 10 µm unit area, were 5.3, 5.7 and 6.1, respectively. There was no difference in terms of the number of cuticles (Table 1). The cuticle morphology was evaluated as being ondular or sawtooth-like. There was no difference in morphological appearance of the cuticles according to the region.

In group 2 the mean diameter of the hair follicle from the scalp, back and gluteal region were 58.9, 45.6 and 46.4 µm, respectively. These values are the similar with the hair diameter of the cases with pilonidal disease. Furthermore, the mean number of cuticles in unit area was similar between the groups (Table 2). The cuticle morphology was also similar in between the groups.

To determine if the hair morphology changes by age, the cases were divided in two subgroups (below and above 30 years of age) and compared (Table 3). The results showed that the hair features are not changed by age.

In group 1, the hair follicles taken from inside of the sinus were also evaluated. The outer part of the follicle (projecting out of the sinus) kept their normal morphological features. However, the inner part of the follicle lost their morphological features and cuticle pattern due to the inflammation (Figure 1).
Discussion

Pilonidal disease usually affects the young male population. The main etiological factor is the hair follicle. Furthermore, the local factors that ease the entrance of the hair also play important role. The higher incidence in the male population and in people working with hair follicles like barbers shows that the hair is the main factor. The deep intergluteal sulcus, the number of loose hair follicles and straight and rigid hair follicles have important role in the etiology (8). There are several studies evaluating the etiology of pilonidal disease. In those studies, body mass index, gender, the frequency of hair, the spent by sitting, frequency of shower, local hygiene and family history were determined as risk factors (9-13).

It is shown that local hygiene is important in prevention of recurrences. Moreover, laser epilation is found to be affective in prevention of recurrences (14, 15). Schulze et al used laser epilation as an auxiliary method in 5 females and 18 males (16). They reported that laser epilation accelerates the healing and decreases the recurrence.

According to those data, one can conclude that the hair is the main etiological factor. Also, the lower incidence in females supports this. Removal of the hair from the intergluteal region (by shower, epilation etc.), is the main way in prevention of primary or recurrent disease (14, 15, 17). Although the main factor is the hair; there are limited studies about this etiological factor. Dahl et al, in 1992, evaluated the electron and light microscopic features of hair follicles in pilonidal disease (18). They reported that, the sharp tip of the hair eases the entrance and the hook like body makes it difficult to get out. There are no more studies in literature about this issue. It is generally accepted that hook like cuticle pattern of the hair eases the entrance and advancement in subcutaneous tissue. This study showed that inside of the sinus the hair loses it cuticle pattern.

Similar to Dahl et al, our study showed that the hook like cuticle pattern of the hair makes it difficult to get out the sinus tract (Figure 1). In some studies, the straightness and rigidity of the hair were reported as etiological factors (8). However, in this study there was no difference in mean diameter of the hair between the subjects with pilonidal disease compared to those without it. The hair inside of the sinus was deformed and lost its cuticle pattern due to inflammation. Furthermore, it is not possible to determine the source of the hair follicle as scalp, back or gluteal region by their microscopic findings (number of cuticles, diameter etc.). Age is known as an etiologic factor in pilonidal disease. The changes in hair follicle by age were evaluated, and no difference was found by scanning electron microscopy.
Conclusions

According to above data;

1. It is not possible to determine the source of the hair follicle by its morphological findings by electron microscopy. There was no difference in the morphological findings of hair taken from scalp, back and gluteal region.

2. There was no difference in hair morphology between subjects with pilonidal disease compared to those without it from the same age group. There is no information to support that the difference in hair morphology has a role in etiology of pilonidal disease.

3. There is no finding showing the relation between the decrease of incidence of pilonidal disease and the change of hair morphology, by ageing.

4. Inside of the pilonidal sinus the hair loses its cuticle pattern and morphological features.

To conclude the hook like cuticle pattern of the hair is the main factor in pilonidal disease. The hair can be from any part of the body. The hair frequency can play an important role as forming a net in the deep intergluteal region (Figure 2). Therefore, removal of the hair only from the intergluteal region can be effective and the shave or epilation of the larger areas may be unnecessary.
References


**Table 1:** Hair follicle demographics in cases with pilonidal disease

<table>
<thead>
<tr>
<th></th>
<th>Scalp</th>
<th>Back</th>
<th>Gluteal</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hair diameter</td>
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<td>52,8</td>
<td>51,2</td>
<td>&gt;0,05</td>
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<tr>
<td>Cuticle number</td>
<td>5,3</td>
<td>5,7</td>
<td>6,1</td>
<td>&gt;0,05</td>
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</tbody>
</table>

**Table 2:** Comparison of hair characteristics from different parts of body in between cases and volunteers

<table>
<thead>
<tr>
<th></th>
<th>Scalp</th>
<th>Back</th>
<th>Gluteal</th>
<th>Control</th>
<th>Case</th>
<th>Control</th>
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<tbody>
<tr>
<td>Hair diameter</td>
<td></td>
<td></td>
<td></td>
<td>58,9</td>
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<td>45,6</td>
<td>52,8</td>
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<tr>
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<td>5,3</td>
<td>5,8</td>
<td>5,7</td>
<td>6,1</td>
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</tbody>
</table>

**Table 3:** Hair follicle finding in cases below and above the age of 30

<table>
<thead>
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<th>Gluteal</th>
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</thead>
<tbody>
<tr>
<td>Hair diameter</td>
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<td>53,3</td>
<td>52,6</td>
<td>51,3</td>
</tr>
<tr>
<td></td>
<td>&lt;30 years</td>
<td>53,6</td>
<td>53</td>
<td>51,1</td>
</tr>
<tr>
<td>Cuticle number</td>
<td>&gt;30 years</td>
<td>5,3</td>
<td>5,5</td>
<td>6,3</td>
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<tr>
<td></td>
<td>&lt;30 years</td>
<td>5,3</td>
<td>5,8</td>
<td>5,8</td>
</tr>
</tbody>
</table>
Figure 1. Figure showing the difference of the cuticle pattern of the hair from inner and outer part of the pilonidal sinus.

Figure 2. The net formation at the intergluteal sulcus