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ORIGINAL ARTICLE

Classification and Frequency of Crown Whirlpool Patterns in Male Hair Transplant Patients

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ABSTRACT

Background: Many males around the world struggle with androgenetic alopecia, more often known as male pattern baldness. Hair in the crown area of the scalp tends to arrange itself into spirals or swirls when seen from above. Although crown whorl patterns in male hair transplant patients are important, there is only limited information about them.

Materials and Methods: A cross-sectional study was conducted from June 2022 to January 2023. All male patients, aged between 20 and 65, getting hair transplants were part of the study. A scalp exam and preoperative photos were done to determine if the head has a singular, double or indetectable whorl pattern.

Results: Three main groups for the crown hair whirlpool were found: single 29 patients (58%), dual 3 patients (6%) and undetectable 18 patients (36%). The site where most single whirlpools (90% of cases) were observed was the central position, while dual and variant patterns were found in the parietal and right/left parietal areas making single pattern more prevalent with central position when compared to other with chi-square p-value of 0.002.

Conclusion: Preoperative scalp mapping, personalized surgery and thought about hair patterns support improved results for patients. Knowing the differences in hair whorl patterns for men supports the development of better hair restoration methods and increases patient happiness.

Keywords: crown whirlpool, hair transplant, pattern baldness, personalized surgery.

INTRODUCTION

Many males around the world struggle with androgenetic alopecia, more often known as male pattern baldness[1,2]. Hair loss affects more than half of men by the age of 50[3]. Hair transplantation is a known surgical option for MPB that helps people achieve natural-looking results and increase their satisfaction with their treatment[4]. When performing hair transplantation, the patterns of the scalp, notably the crown whirlpool or whorl, greatly help with planning the new hairline and crown[5,6].

Hair in the crown area of the scalp tends to arrange itself into spirals or swirls when seen from above[7]. Different sizes and numbers of hairs or when they are not visible, are important for hair transplant surgeons. They can change both the look of the results and the difficulty of surgical steps[8]. It is very important to correctly find and group these patterns so that the doctor can plan the best place and amount of hair grafts, avoiding unnatural looks or issues following the procedure[9,10].

Although crown whorl patterns in male hair transplant patients are important, there is only limited information about them and this is more pronounced in South Asian patients[11]. Additionally, the study explores potential associations between whorl patterns and demographic variables, family history of baldness, and lifestyle factors[13-15]. Our findings are expected to inform preoperative assessments and surgical planning, contributing to improved aesthetic outcomes in hair restoration procedures. Moreover, this study highlights the utility of combining traditional clinical methods with modern digital tools to enhance pattern recognition and classification (16-19).

MATERIALS AND METHODS

We carried out this cross-sectional study at the Hair Transplant Unit of Bolan Medical Complex, Quetta, from June 2022 to January 2023. An IRB at Bolan Medical College gave ethical approval for the study. All male patients, aged between 20 and 65, getting hair transplants were part of the study. Every participant gave informed permission to take part in the study.

A cross-sectional study was performed and all data were gathered from a single tertiary care center, preserving uniformity in how surgeries were assessed. The purpose of collecting patient data included recording age, where they lived, what they did for a living and whether they had bald relatives. A scalp exam and preoperative photos were done to determine if the head has a singular, double or indetectable whorl pattern. By coding visual data with NVivo, it became easier to find patterns in the information. All statistical analysis was performed using SPSS version 25. During the study time frame, 50 eligible patients were chosen by consecutive sampling.

Statistical Analysis: We computed the mean, standard deviation, frequencies and percentages for both patient descriptions and whorl types. To identify relationships between categorical variables, we used inferential statistics, Fernando used Chi-square and Fisher's exact tests. Preoperative photographs were studied for analysis in NVivo. The research considered the p-value to be significant only if it was less than 0.05.

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RESULTS

In this study, 50 male patients who received hair transplants were examined. Participants had a mean age of 34.6 years with a standard deviation of 6.2, with ages varying from 22 to 47 years. 84 percent of the patients were Quetta residents and the remaining 16 percent were from Islamabad. When it comes to education, 72% had secondary school or higher and 60% were married.

Table 1: Demographic Characteristics of Patients (n = 50)

Variable	Frequency (%)
Age (Mean ± SD)	34.6 ± 6.2 years
Location	
– Quetta	42 (84%)
– Islamabad	8 (16%)
Marital Status	
– Married	30 (60%)
– Unmarried	20 (40%)
Education Level	
– Secondary+	36 (72%)
– Below Secondary	14 28%)

Three main groups for the crown hair whirlpool were found: single 29 patients (58%), dual 3 patients (6%) and undetectable 18 patients (36%). The site where most single whirlpools (90% of cases) were observed was the central position, while dual and variant patterns were found in the parietal and right/left parietal areas making single pattern more prevalent with central position when compared to other with chi-square p-value of 0.002.

For assessment of association with baldness grade and family history chi-square was employed and it was observed that baldness grades were lower in singular whirlpool patients (Grades

II–III) compared to higher grades (IV–VI) in undetectable patterns as explained in table 3. Family history of baldness was positive in 64% of patients with undetectable patterns, compared to only 24% in singular types ($p < 0.05$).

Table 2: Distribution of Crown Whirlpool Patterns

Whirlpool Pattern	Frequency (%)	Typical Location	p-value
Singular	29 (58%)	Central (90%), Parietal	
Dual	3 (6%)	Parietal	
Undetectable	18 (36%)	N/A	0.002

Table 3: Association of Whirlpool Patterns with Baldness Grade and Family History

Pattern	Mean Baldness Grade	Positive Family History (%)	p-value
Singular	II–III	7 (24%)	0.002
Dual	III–IV	2 (66%)	
Undetectable	IV–VI	11 (64%)	

Patients with singular whirlpool patterns showed the most efficient graft distribution, requiring fewer grafts for coverage and showing greater improvement in pre- to post-transplant scalp coverage. For singular whirlpool pattern a total of 2800 + 650 grafts were used.

DISCUSSION

It was found that the main whirlpools are always centrally located, near the tip of the hair, a feature noted in previous work on hair patterns[1]. Our study reveals that the most frequent hair pattern at men's crowns (nearly half with a single whorl) follows the findings of Kim et al.[2]. The finding of dual whirlpools in a few patients expands our knowledge about reasons behind the differences in scalp hair pattern and may represent a genetic or developmental factor[3]. Experiments indicate that the positioning of hair whorls is decided at the embryo stage, probably affected by Wnt and Shh signaling controlling where the dermal papillae and hair follicles develop[4]. Furthermore, when whirlpools are absent or hard to find in some patients, this may be due to advanced androgenetic alopecia or scarring alopecia damaged patterns in hair follicles and nearby tissue[5].

Experts are still discussing whether whirlpool patterns are related to a person's genetic risk for baldness. Several researchers suggest that vertex hair loss patterns may come from familial androgenetic alopecia and that crown whorls might be an early sign[6]. A large number of participants with advanced baldness did not have easy-to-see whorls, signaling that baldness can conceal the normal patterns on the scalp[7]. However, to check these findings further, research with genetic testing and long-term studies is needed[8]. The clinical value of whirlpool pattern classification applies in hair transplant procedures. Figuring out the person's natural hair whorl allows you to plan where grafts will be placed so that their growth direction looks natural. A poor imitation of the natural side wave might look strange which is why it is important to carry out preoperative scalp mapping[10]. We discovered that most male patients have a single, central whirlpool and this can help surgeons position grafts correctly for crown reconstruction[11].

Also, if someone's fingerprint shows dual or lateral whorls, a different method may be needed. In some cases, patients requiring dual whirlpools may demand more advanced planning of the graft's shape and placement to attain an even look[12]. The findings of this study can help surgeons refine treatment techniques, so that the skin in such patients is well-covered with minimal scarring after transplant[13]. Photographs and detailed analyzes of whirlpool patterns are part of the method used in this study which falls in line with industry standards[14]. Still, a few constraints can't be ignored. Since the cohort came from just one center, the findings might not apply to many communities with different ethnic or genetic backgrounds[15]. Still, while the cases were enough to see main pattern types, confirming these observations will take more studies done in multiple centers[16].

In addition, although the study mainly concentrated on identifying macroscopic whirl patterns, it did not explore the biological factors controlling hair whorl formation and differences by using tissue or DNA analysis[17]. Additional research using all of these methods might give us a better look at scalp patterning. Reliable findings from photographs can be made more likely by using this software[19]. Hair pattern differences among men undergoing hair transplants should be carefully taken into account. Being able to see the hair whorl again and restore the hairline can make a difference in both self-esteem and confidence when mixed with other treatments[18]. Research has pointed out that living with hair loss can add stress, though treatment with hair transplantation can help reduce this and make a big difference in patients' lives[21]. As a result, a thorough understanding of hair pattern differences aids both surgical planning and helps ensure patients are happy and feel their best[22].

CONCLUSION

Hair transplant surgeons should aim to cluster grafts in whirlpool shapes to get the best-looking results. It is noted in the study that preoperative scalp mapping, personalized surgery and thought about hair patterns support improved results for patients. Knowing the differences in hair whorl patterns for men supports the development of better hair restoration methods and increases patient happiness.

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