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ORIGINAL ARTICLE

Diagnostic accuracy measures for vertical and transverse scalp biopsies in cicatricial and non-cicatricial alopecias

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ABSTRACT

Background: Scalp biopsy provides worthwhile diagnostic clues to diagnose the noncicatricial or cicatricial type of alopecia. Although a pair of vertically and horizontally sectioned pathology samples would be ideal, the diagnostic yield of vertical (V) or transverse (T) sectioning in different types of cicatricial and non-cicatricial alopecia is not studied. Also, when a single biopsy is submitted and/or the sample is not large enough for a combined V and T sectioning from a single specimen (such as HoVert technique), the decision to make the most appropriate sectioning would be challenging, specifically depending on the type of alopecia suspected clinically.

Methods: A prospective study included 194 patients with two 4 mm-punch biopsies, one was sectioned vertically and the other horizontally. The V and T diagnoses were compared with the final diagnosis. The kappa coefficient of agreement, sensitivity, specificity, likelihood ratio (LR), diagnostic odd ratio (DOR) and concordance were estimated.

Results: The most common types of alopecia were lichen planopilaris (62, 31%), androgenic alopecia (36, 18%) and central centrifugal cicatricial alopecia (26, 13%). The perifollicular inflammatory cell types, presence of pigmented cast and sebaceous hyperplasia were adequately detected in the in T ($p < .001$). The subcutaneous inflammation was better detected in V ($p < .001$). The T revealed higher diagnostic accuracy compared with V especially for noncicatricial alopecia (DOR, 157.5 vs. 21.2, $p < .001$).

Conclusions: The accurate diagnosis of alopecia requires both vertical and transverse section examination. Techniques providing both horizontal and vertical sections may be best suited for this indication. However, when expertise in such novel techniques are lacking, the higher diagnostic accuracy for T section justifies using T section for noncicatricial alopecia, if patient consented for single biopsy.

Introduction

The diagnosis of alopecia can be particularly challenging both for the clinician and the pathologist. Scalp biopsy provides worthwhile diagnostic clues when clinical observation and medical history alone fail to diagnose the type of alopecia. Since the introduction of horizontal scalp biopsy sectioning by Headington et al., the combination of conventional vertical (V) biopsies with horizontal/transverse sections (T) has been advocated by some authors to improve the diagnostic yield for alopecia.[1–3] T allows the pathologist to visualize most or all of the follicles in the sample tissue and therefore, provides a more accurate quantitative analysis of

Abbreviations: T, Transverse section; V, Vertical section; C, Cicatricial alopecia; NC, NonCicatricial alopecia; NAHRS, North American Hair Research Society; DEJ, Dermoepithelial Junction; AA, Alopecia Areata; AGA, Androgenic Alopecia; CCCA, Central Centrifugal Cicatricial Alopecia; DLE, Discoid Lupus Erythematous; FD, Folliculitis decalvans; FA, Fibrosing Alopecia; FAPD, Fibrosing alopecia in a pattern distribution; LPP, Lichen planopilaris; TA, Traction Alopecia; TM, Trichotillomania.

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terminal, vellus, catagen and telogen hair counts. On the other hand, V section demonstrates the entire skin depth in every section providing information on the pathological details of the dermoepithelial junction (DEJ), papillary dermis, and the panniculus.

When one skin sample is provided (e.g. the patient only consents to one biopsy), the decision to make V or T can become particularly challenging.[3–5] Overall, few studies have evaluated the diagnostic accuracy measures for the V and T in the diagnosis of cicatricial and noncicatricial alopecia.[6,7] There are studies that preferred either the T,[7] the V[4] or the methods to perform both V and T on a single biopsy.[2,8–12] In addition, it has been suggested to choose V or T based on the clinical impression of the noncicatricial or cicatricial type of alopecia, at the discretion of the pathologist.[6] The North American Hair Research Society (NAHRS) consensus stated that combining V and T is optimal when there are two biopsies and it suggested the T when a single biopsy was submitted.[13]

Previously few studies calculated the concordance rates to demonstrate the diagnostic yield of T vs V. The concordance rate among the V, T and original diagnoses have been different in populations with different prevalence of cicatricial and noncicatricial alopecia. Concordance rate was reported 75% in a population heavily weighted towards cicatricial alopecia (C: 60 vs NC: 42)[6]; it was 82% in other population with more non-cicatricial alopecia (C:17 vs NC:30)[7]; and it was 100% in other population with weighted towards non-cicatricial alopecia (C: 64 vs NC:212).[14] The concordance rate is dependent on the prevalence of disease in the studied population. Therefore, different studies with different prevalence of cicatricial or non-cicatricial type of alopecia would report different concordance rate for H or V biopsy. In addition conclusions based on the concordance rate should be made with caution since they may only be applied to the populations with the similar prevalence.

In order to resolve the discrepancy in diagnostic conclusions due to different prevalence in study populations, the Cochrane collaboration highly recommends using the diagnostic accuracy measures that are independent on the disease prevalence – such as sensitivity, specificity and diagnostic odd ratio (DOR) in every diagnostic accuracy study and meta-analysis of the systematic review.[15]

The goal of this prospective study, was to evaluate the diagnostic V or T sectioning in different types of cicatricial and non-cicatricial alopecia. The result of this study can help decide which sectioning is preferred, especially depending on the clinical suspicion of the type of alopecia, when a single biopsy is submitted and/or the sample is not large enough for a combined V and T sectioning from a single specimen (such as HoVert technique). We used the independent statistical measures for diagnostic accuracy measures, such as sensitivity, specificity and diagnostic odd ratio (DOR) to evaluate the outcome because they are not influenced by prevalence of the disease.

Materials and methods

The study was approved by the Ethics Board of Tehran University of Medical Sciences, Tehran, Iran. It was a prospective study, performed at Razi Dermatology Hospital between February 2011 and March 2013. The consenting patients with suspected cicatricial alopecia and those with the clinical features of noncicatricial alopecia who could not be diagnosed by clinical history and dermatological examination alone, were included. Two 4-mm punch biopsies extending to the subcutaneous fat were taken from all patients from the active peripheral margin in cicatricial alopecia and from an area most representative of the clinical features of active disease in suspected noncicatricial alopecias. One of the biopsy specimens was sectioned transversely (horizontally) and the other one was cut vertically and additional 3–5 consecutive sections from the transverse and vertical blocks were prepared and stained with hematoxylin and eosin.

All of the transverse and vertically sectioned slides were reviewed by two board certified dermatopathologists (K. KH. and A. GH.). During initial review the Dermatopathologists were blinded to the patient identification and any clinical primary or final diagnoses. They were asked to evaluate the important questioned histopathology features and make the primary diagnosis based on pathology examination that they both agree on. In case of discrepancy, they discussed the slides together and a consensual decision was reached and documented. The final diagnosis, was the consensual diagnosis made by the treating dermatologist and dermatopathologist based on clinical presentation, histopathology examination of overall V and T sections and if needed, the supportive direct immunofluorescence study.

The diagnostic histopathology features of different types of alopecia were evaluated. The coefficient of kappa estimated the agreement among V and T. The kappa >0.75, 0.75–0.40, <0.40 were interpreted as excellent, fair to good, and poor agreement, respectively.[16] Higher values of kappa denoted higher agreement – indicating that both method showed comparable diagnostic yield. Lower values of kappa, showed that the histopathology features were better examined in either V or T and the more feasible section was determined by using T-test and Fisher's exact χ^2 test for categorical and numerical variables, respectively. p-value <0.001 was considered statistically significant. Two categories of diagnostic accuracy measures were calculated, prevalence dependent and independent (Appendix-1). Sensitivity, specificity and the measures based on them, such as likelihood ratios of a positive test (PLR) and diagnostic odd ratios (DOR), were not influenced by the prevalence of the disease in the studied population.[15,17,18] Concordance (accordance) rate, used in previous studies[6,7] was defined as the proportion of identical diagnosis by T and V from the total diagnosis. Concordance was defined as proportion of diagnosis from total when the diagnosis of cicatricial vs noncicatricial made by T, V and final were identical. It was affected by the prevalence of the disease in studied population.[18] MATLAB R2013a and SPSS version 20 software were used to perform the statistical analyses.

Results

200 biopsy samples from patients with the mean age of 37.7 years (range: 7–72 years), consisting of 124 (62%) females were studied. We were able to make definite diagnoses for 194 cases and six biopsies remained a diagnostic challenge despite the consensus and clinical correlation. Therefore, we included 194 cases in the analyses. The cicatricial to noncicatricial alopecia ratio was 1.86 (132–62). Table 1 presents a summary of the descriptive characteristics of the patients, the types of alopecia and the diagnostic clinical and histopathology features in each type of alopecia.

V section versus T section

The hair follicles examination, revealed higher number of follicles in all different stages of hair cycle in T compared with V (Table 2).

Table 3 demonstrates the diagnostic agreement between V and T for selected histopathology features. The agreement was fair to excellent for perifollicular inflammatory cell depending on the cell type (K = 0.85–0.64), excellent for follicular pigmented cast (K = 0.78) and fair for sebaceous hyperplasia (k = 0.69). The agreement was poor for features including hair layers distortion (k = 0.29), follicular atrophy (k = 0.28), fibrous band (k = 0.12), etc. These feature were reported more often in either V or T examination (Table 3).

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