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The Association Between Scalp Laxity, Elasticity, and Glidability and Donor Strip Scar Width in Hair Transplantation—A New Elasticity Measuring Method

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INTRODUCTION

Careful assessment of the donor area is crucial when planning hair transplantation. The density, caliber, and curliness of donor hair, as well as the laxity, elasticity, and glidability of the scalp are important factors in this assessment. However, a simple, accurate method of assessing scalp laxity, elasticity, and glidability in a clinical setting is lacking. Accurate evaluation of donor scalp parameters expedites the choice of a suitable surgical method, preoperative planning, and prediction of surgical outcome, including width of the eventual scar.

Seery described scalp laxity as the sum of elasticity and glidability, and reported that strip surgery within the range of glidability will result in a complication-free surgery.¹ In patients with hyperelastic skin, scar widening can occur, as explained by the laxity paradox.²

Various methods of measuring scalp laxity have been introduced, but none accurately measures elasticity and glidability in a simple manner. Wong assessed vertical laxity by pushing the scalp upwards and downwards when determining the width of the donor strip.³ To determine strip size, he measured scalp laxity repeatedly at the initial consultation, at the preoperative examination, and just before application of anesthesia to the donor area. Feldman assessed tissue elasticity by injecting saline and measuring the degree of tissue ballooning.⁴ The Mayer-Pauls scale is a reproducible and objective method of measuring scalp elasticity, based on the following formula:

$$\text{Scalp elasticity} = (50\text{mm} - x)(100\%)/50\text{mm}$$

where x is the distance during maximum compression between two marks made at a horizontal distance of 5 cm on the occipital scalp. Mayer suggested that if elasticity according to this scale is $> 30\%$, then the scalp laxity paradox can occur.⁵ In these cases, the surgeon should be aware of the possibility of a wide ($> 4\text{--}6$ mm) scar at the donor site.

Mohebi developed a mechanical device called the Laxometer in 2008 and a second-generation model in 2012.⁶ The Laxometer is designed to mark the maximum extent of scalp mobility.⁷ Pathomvanich and colleagues measured laxity with a crossbeam laser while moving the scalp in the vertical plane.⁸

Glidability refers to the area through which the galea layer glides, whereas elasticity refers to the stretching of the skin due to the elastic dermal component. Therefore, to accurately measure elasticity, one should fix the galea layer to prevent gliding while at the same time stretching the skin.⁹

Hyperelastic skin plays a crucial role in the formation of wide strip scars, which preclude patients from wearing short hairstyles and necessitate scar revision surgery or secondary grafting on the donor scar. Therefore, elasticity has clinical significance in predicting donor scar formation with hair transplantation via the strip method. However, current methods only allow measurement of scalp laxity; a simple and effective technique to measure elasticity has not yet been described.

MATERIALS AND METHODS

The medical charts of 88 patients (54 men, 34 women; mean age 31.1 years, range 21-57) who underwent strip surgery from February 2014 to February 2015 at Dana Plastic Surgery Clinic, Seoul, Korea were re-



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