The Laxometer: increasing the safety of hair transplants that use a large number of grafts

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Hair restoration has made significant advancements in the past decade and even more so in the past several years. One of the advancements that we are witnessing is that the number of grafts that can be transplanted in a single session has increased dramatically. The transplanting of the larger numbers of grafts is referred to as a gigasession.

Gigasessions are becoming very popular because patients with a relatively advanced class of baldness can complete full hair restoration with just one surgery. This tremendously increases the attractiveness of electing hair transplant surgery to alleviate the negative impact of hair loss on a person's life.

New techniques and innovations in hair transplantation, availability of larger surgical teams, as well as the increasing demand of hair loss patients are responsible for these trend changes. Although hair restoration using a large number of grafts is receiving ever increasing popularity due to its exceptional benefits to the patients, a new series of issues and concerns arises from conducting larger size hair transplant surgeries. These problems either did not previously exist or they were extremely rare.

Donor wound complication due to a tight closure is one of the most significant problems that needs to be addressed by hair transplant surgeons who perform hair transplants with a large number of grafts on a regular basis.

A large number of grafts can be harvested if the density of the donor area is adequate and if the surgeon can remove a large strip. The surgeon cannot increase the size of the strip simply by increasing the length of it because the strip length is already maximized in most cases. Hair density in the donor area is usually constant. This leaves one variable that can be altered: the width of the strip. The donor strip width can be enlarged to increase the number of harvested follicular units.

This critical change places the importance of scalp vertical laxity to the forefront for the success of a large hair transplant procedure. Thus, precise scalp laxity evaluation becomes crucially important prior to performing large hair transplant surgeries.

The width of the strip cannot be increased in every case secondary to a patient's individual variances of skin characteristics and skull size that may affect the free mobility of scalp. If a surgeon removes a strip that is too wide, the closure of the donor wound might not be possible or the donor wound might be closed with excessive tension, particularly if the scalp's mobility is limited.[1] The tight closure of the donor wound may affect the blood supply of the skin and lead to ischemia around the closed wound. Ischemia in the wound can lead to telogen effluvium or necrosis, and it might also be associated with stretching of the scar beyond what is considered normal.[2]

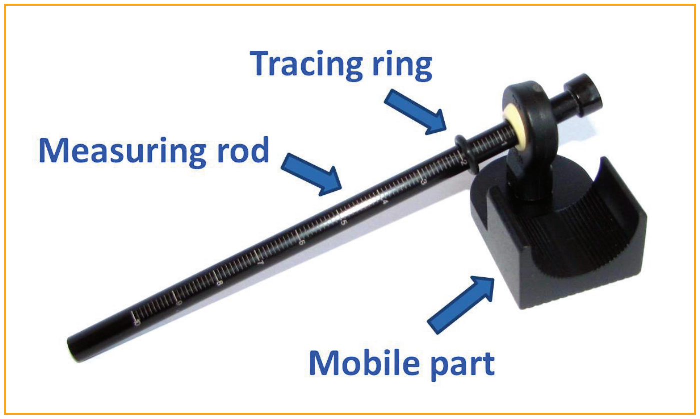

Figure 1. The parts of the Laxometer.

Scalp Laxity and Its Role in Scalp Surgery

Proper measurement of scalp laxity has become a key element that a surgeon needs to have available before proceeding with a hair transplant surgery with a large number of grafts. Evaluation of scalp laxity was traditionally conducted through manual palpation of the donor area and by moving the scalp horizontally or vertically.[3] The surgeon simply estimated the scalp movement against the occipital bone using his or her hands on the back and sides of the scalp. The manual measured laxity was recorded subjectively with terms such as loose, average, or tight. The Mayer Scale was a great step forward in providing a simple method to estimate the percentage of scalp elasticity horizontally,[3] but there was still a need to develop a device that could measure the vertical forces involved in scalp laxity. The device also needed to be able to factor the other forces that are involved in large hair transplant procedures. This includes the effect of the tension of the opposite side of donor wound that can play a crucial role in some individuals when a large strip is removed.

The Laxometer was developed to address the increasing need for a metric for scalp laxity measurement to eliminate human error and to standardize our way of describing scalp laxity.[4] The first generation of Laxometer was able to measure the mobility of the two sides of the strip by pulling the two sides of the strip together. This method could represent the safe width of the strip that could be removed. Although the initial Laxometer could evaluate the mobility of the scalp in most situations, at times it reported the scalp to be tighter than it was in reality.

The reason for a false positive reading was because of the variation in the individual thickness of the skin compressed between the two approximating jaws.

The second generation of Laxometer (Laxometer II) resolves this issue and represents a forward step in the precision of determining scalp laxity in hair transplant patients. It accurately measures the upward and downward mobility of the scalp on one central position of the permanent zone. This can be translated as the amount the upper and lower edges of the wound can move freely. The Laxometer II operates with only one pad, and that can eliminate the limiting effects that scalp skin thickness has on the reading of scalp mobility.[5]

How does the Laxometer work?

The Laxometer has three main portions: a mobile part, a measuring rod, and a tracing ring (Figure 1).

2. The mobile part has a rough surface that is going to be in touch with the patient's scalp and is held by pressing the operator's thumb over the scalp. This can provide a tight grip on the scalp and prevent any slipperiness of the part over the scalp. The mobile part then moves the scalp up and down to measure the levels of scalp mobility.
3. The measuring rod is a gauged rod that the operator's other hand keeps stable, and it registers the distance between the outermost superior to inferior point that the mobile part can freely move. The movements of the mobile part represent the mobility of the scalp underneath it.
4. The tracing ring is a solid rubber ring that is positioned around the measuring rod and records the extent of mobility of the mobile part that indicates the mobility of the scalp. The Laxometer measures the movement of the scalp over the skull from its most superior to the most inferior position. It is made from black anodized aluminum and heat-resistant plastic material. It can be washed and autoclaved safely.

Applications

The Laxometer is utilized during initial examination and pre-operative evaluation of the patients before a strip hair transplant surgery. The accurate results achieved by using the Laxometer helps the surgeon determine the maximum width of donor strip that can be removed. In our initial studies utilizing the Laxometer, we were able to demonstrate and verify the increased laxity of scalp in patients who have tight scalps and have completed a period of scalp exercise program. When utilizing the Laxometer in periodic pre-operative examinations of patients undergoing scalp exercises, measurable improvement of scalp laxity was noted. These examinations also helped determine the optimum time for the patient's hair transplant surgery. Our previous experience indicates that scalp laxity can be significantly improved with application of scalp exercise for a few weeks prior to hair transplantation.

The other application of the Laxometer is measurement of scalp mobility intra-operatively when the strip is being removed in two sections to minimize the risks involved with removing one large strip that is wider than what the patient's scalp can tolerate. This method is called "sequential strip removal." It has been introduced to increase the safety of hair transplant procedures using a large number of grafts to allow the surgeon to measure the alteration of scalp laxity on the secondary portion of the scalp after removal of the strip from the primary portion. This is done before the surgeon removes the second portion. Intra-operative measurement of scalp laxity using the sequential strip removal technique can enhance the safety of hair transplants by allowing the surgeon to know about the increased tightness of the scalp that results from the removal of the initial portions of the strip.[2]

Conclusion

The Laxometer can be used to accurately determine the laxity (mobility) of the scalp with reproducible measurements. It can be used prior to the time of surgery by applying a numerical value to scalp laxity, which augments the surgeon's clinical judgment. The Laxometer can also be a valuable tool during a hair transplant surgery by which the surgeon can assess the changes that result from closure of one side of the wound on the opposite side of the scalp. The device can guide the surgeon to alter the size of the strip in the secondary portion if scalp laxity drops after closure of the first portion of the strip. This method can minimize the donor complications secondary to a very tight closure.

Another application of the Laxometer is in evaluating the improvement of scalp laxity in patients with tight scalps that go through a period of scalp exercise before their procedure. The Laxometer can track the alterations in scalp laxity and determine the best time for when a patient's scalp is ready for hair transplant surgery.

References

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A note from Melvin L. Mayer, MD ABHRS (*San Diego, California, USA* *mayer@bosley.com*): My compliments to Dr. Mohebi for continuing to create new instrumentation and keeping the important issue of wound tension in front of *Forum* readers.

In my opinion, the two major causes of excessive strip scars are 1) excessive width of donor excised, producing excessive tension; and 2) genetic skin characteristics of above average scalp laxity, which Bernstein describes as the "scalp laxity paradox" (Bernstein, R. The scalp laxity paradox. *Hair Transplant Forum Int'l.* 2002; 12(1):122-123).

The author states that "hair density in the donor area is usually constant." I disagree with this because there usually is variability within the donor comparing the occipital area to the supra auricular region and from patient to patient.

Editor's note: Dr. Mohebi's new tool appears to offer an evolution of the laxity work begun by Dr. Mel Mayer. I have no experience with laxity tools and accordingly only make remarks qualified by this limitation. I ask others with different opinions to write letters to the editors. I agree with Dr. Mohebi that when trying for a maximum number of grafts, there is nothing that can be done pre-operatively that is better than the intra-operative sequential harvesting in which the closure tension is checked at small intervals. However, that a tool is mandatory to achieve this is unclear to me. A tool is only as good as the mind behind it. Whether the maximum harvest is better done with a tool or the surgeon's feel of tension probably varies with the preferences and experience of the surgeon. Nonetheless, it is enticing to consider that the two can work together to achieve the highest frequency of safe closures and eventually be better than either approach alone. Bravo to Dr. Mohebi for pushing the evolution of our specialty. —WR◆