Incisions: Coronal vs Sagittal (Pro Sagittal)

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When choosing the orientation of incisions made in the scalp, the natural orientation of collagen fibers must be considered. Cleavage or Langer's lines (Figure 1) are defined as, "any number of linear striations in the skin that delineate the general structural pattern and tension of subcutaneous fibrous tissue."[1] In microscopic sections cut parallel with these lines, most of the collagenous bundles of the reticular layer are cut longitudinally, while in sections cut across the lines, the bundles are in cross section. [2] Furthermore, the lines run obliquely lying *in the direction in which the skin stretches the least, perpendicular to the direction of the greatest stretch.*[1] The cleavage lines are of particular interest to the surgeon because an incision made parallel to the lines heals with a fine linear scar, while an incision across the lines may set up irregular tensions that result in an unsightly scar.[2]

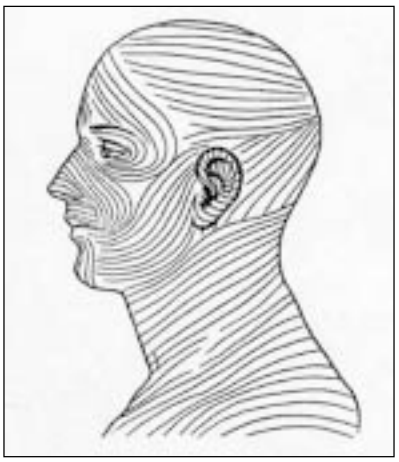

Figure 1. Langer's lines

During hair transplantation, grafts are commonly placed into small incisions. With shorter incision length, less *linear incision damage* and *linear healing surface* will be created.[3] As a result, less scar tissue is formed. The greater the tissue stretch, the shorter the incision needed. Incisions oriented sagittally, parallel to Langer's lines, can be made shorter as *the direction of stretch is greater perpendicular to the incision*. In other words, a sagittal incision will spread more, accommodating a larger graft and facilitating ease of insertion compared to a coronally oriented incision. Conversely, a smaller incision is needed in the sagittal direction versus coronally to accommodate the same sized graft. The differences in incision length per graft are small but the cumulative effect of thousands of incisions is significant, a greater amount of scar tissue. Fibrous scar tissue replaces elastic tissue rendering the skin thinner and less flexible, an effect that can be significant in subsequent sessions. Scar tissue causes color changes, hypo- and hyperpigmentation, and altered light reflection causing an unnatural appearance of the scalp.[3] Making graft placement easier reduces the potential for graft trauma and reduced growth and density.

It is important to incise the scalp through the dermis into the subcutaneous tissue. Only by releasing the entire layer of collagenous bundles can the full advantage of perpendicular stretch be realized. In addition, the dermal papilla must ultimately be relocated to the subcutaneous tissue.

To produce maximal density in one session, incisions are made as close as possible. To be able to "dense pack" follicles, shorter incision length allows more incisions per square centimeter to be made. Preventing unnecessary tissue damage by making shorter incisions reduces the chance of necrosis when "dense packing."

To make incisions, I prefer microsurgical sharppoint scalpels. These are thin scalpels tapered at 15°, 22.5°, 30°, and 45° angles (Figure 2. Right—22°). The larger the angle is, the longer the incision. The tapered point creates a tapered incision that, while releasing the collagenous bundles of the dermis, causes minimal tissue damage at the base (deepest aspect) of the incision. Chisel pointed scalpels (Figure 2. Left—1.5mm Minde) that are not tapered distally, in my experience, cause more bleeding. The tissue damage at the base (deepest aspect) of the incision will be greater due to the design of the instrument.

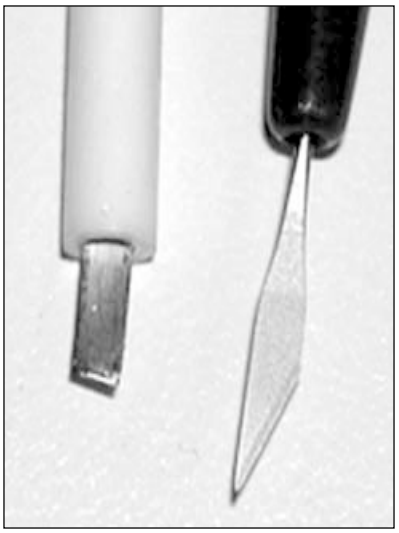

Figure 2. Close-up of scalpels

The scalp's blood supply from the superficial temporal artery traverses the scalp in a coronal direction. Incisions made coronally incise these vessels parallel to their direction, while incisions made sagittally incise vessels perpendicular to their direction. A chisel point scalp oriented coronally with greater length at its base could damage the vasculature more and cause more bleeding than a sagittally oriented tapered sharppoint scalpel.

Locations in which incisions may not always be made parallel to Langer's lines include the following "specialty" locations: the temporal

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point, the lateral hump, the moustache, and the sideburns. These areas require acute angulation of the incisions. With the blade oriented perpendicular to the skin surface, the incision can be made at an acute angle while at the same time incising the entire epidermis and dermis releasing the collagenous fibrous tissue. When the incision is made with the blade parallel to the skin (flat), the incision may be made too superficial. This is a personal preference. Also, as these areas generally do not require densities as great as the scalp, more space is left between incisions and dense packing is as often not performed. Excluding these few exceptions, it is important to make skin incisions as parallel to Langer's lines as possible.

It has been noted that grafts placed in the coronal orientation may prevent light from traveling through the transplanted hair lessening the "see through" look. This may be true with grafts larger than follicular units. When using follicular units (the most common graft being two hairs), I believe the light blocking effect is not more significant when grafts are oriented coronally versus sagittally.

In conclusion, sagittal incisions in the scalp are advantageous due to the following:

1. Parallel to Langer's lines
2. Less scar tissue formed
3. Greater skin stretch perpendicular to the incision allowing smaller incisions to be made, facilitating ease of graft insertion
4. Greater densities achieved with "dense packing"
5. Less bleeding due to less vessel damage✧

REFERENCES

1. Mosby's Medical, Nursing, and Allied Health Dictionary, 4th Edition
2. Anatomy of the Human Body, Henry Gray, 30th Edition
3. Wolf, BR. An Argument Against Tissue Removal during Hair Transplantation: Incisions vs Punches. *Hair Transplant Forum International*, January/February 2002, Vol. 12, No. 1, pp. 5-7.