



## Facial Wound Coverage using Split Skin Graft from the Scalp: An Objective Color Analysis Tool

A K Sahay

Department of Plastic Surgery, ESI-PGIMS, Joka, Kolkata, West Bengal, India

### ABSTRACT

**Background:** Skin grafting, a major discovery in surgery, has revolutionized the management of large wounds and skin and soft tissue losses. Wound healing is expedited, skin cover is achieved and morbidity and mortality are minimized.

But in cases, where the face has been grafted, disappointment appears with time. The graft starts acquiring a different color and texture. There is shrinkage of the graft also. All these lead to a patchy appearance, facial asymmetry and distortion of facial expressions. The patient is affected psychologically. The surgeon is approached repeatedly to rectify these developments.

Several measures are taken to produce an improvement. They have limitations and are not feasible in all cases. The surgeon often feels that the best answer could have been an appropriately thick skin graft that would match in color and texture with the face without much shrinkage in the future.

**Methods:** Suitable graft donor areas for the face such as the post-auricular area, neck, volar aspect of forearms and so on are all based on subjective assessments. An objective color analysis method would be more precise. This study dwells upon using a color analysis software for making these assessments.

**Results:** the present study used this method of objective assessment of skin grafting for the face, from a less-used donor area, done on 5 patients from the year 2006 to 2014 which approaches the desired results. It was determined with the help of digital photography and a computer using objective color analysis software.

**Conclusion:** Color matching of skin grafts has been done by, not accurate, subjective assessments. This method of objective assessment showed that scalp skin grafts produced a good color match for the face. It also proposes this as a precise tool for future studies in this area.

**Keywords:** Objective color analysis, Split Thickness Skin Graft (STSG), Color Saturation, Red Green Blue (RGB)

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### INTRODUCTION

The author has observed that skin replacement for the face is often required but is commonly overlooked. One comes across several individuals with scars or lesions, of various sizes and shapes on their faces, not infrequently used by them as their identification marks.

Skin losses and scarring on the face occur in injuries, post infectively, post burns and after excision of lesions. On many occasions, skin loss of the face is associated with a life-threatening injury. The treatment of which takes precedence and the face is inadequately or inappropriately treated.

**Objectives:** The study aimed to find a color-matching skin donor area for the face, which would maintain its color and preferably texture with time, and would show minimal or no shrinkage. A completely objective computer-based analysis was to be done, to eliminate all subjective human errors, bias and variations in visual perceptions caused by physiological and environmental factors.

**Principle of color comparison:** Every color is made up of the 3 primary colors Red Green and Blue (RGB) in different proportions (Figure 7). Every color can be analyzed as saturation levels of Red Green and Blue. Colors can then be compared objectively.

**Corresponding email:** sahayorama@gmail.com

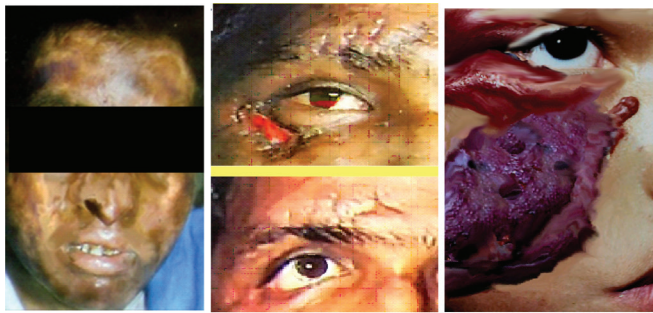


Figure 1

Figure 2

Figure 3



Figure 4

Figure 5

Figure 6

**Figures 1 to 6:** Figure 1- Skin grafts acquire a different color and texture. Figure 2- Periocular skin losses leading to scarring contracture and ectropion. Figure 3- large hemangioma, closure can lead to asymmetry or may not be possible. Figure 4- Skin loss to nose grafted with STSG from thigh has darkened showing a patch-like appearance. Figure 5- Excision of moderate-sized lesions: such as nevi. or Figure 6- Perioral and cheek skin losses resulting in scarring and asymmetry

## MATERIALS AND METHODS

Digital photographs of areas to be analyzed were taken under the same equidistant, diffuse, shadowless light source.

A photo editing software, containing color analysis tools was used. The colors were picked up from the area of interest over these images, and displayed as the RGB composition. The author used GIMP (free software) for this purpose.



**Figure 7:** Red, Green, and Blue are primary colors. Color from the area for analysis was picked up and displayed as RGB Saturation in pixels and percentages.

The colors were compared by analyzing the color composition of the split skin at its recipient site, with the normal adjacent skin of the donor area, after at least 3 months of skin grafting. It was conducted in two parts.

1. *Retrospective study:* 10 Old patients, on whom split skin had been applied on the face with grafts taken from different body areas, were photographed using a high-resolution 6-megapixel

digital camera under the same equidistant light source. RGB composition of the grafts and RGB composition of adjacent skin of Donor areas were tabulated.

2. *Prospective study:* The donor area that showed the best RGB match and least change of color with the progress of time was used for doing STSG on the face in 5 cases<sup>1</sup> and subsequently assessed similarly.

## RESULTS

RGB saturation fell uniformly for each of the 3 colors in all retrospective cases when analyzed after 3 months of grafting. This showed that the grafts had turned darker in color. RGB fall was highest when the graft was from a distant area such as the thigh. A difference of nearly 30% was seen. RGB saturation fell minimally when it was from areas closer to the face. Post auricular skin was the best match but was limited in availability.

In one case of baldness (Figure 10), it was observed that the RGB color composition matched excellently with the face. Here split skin had been used from scalp with good results. The graft had darkened by 5% only at 3 months after grafting.

## DISCUSSION

The present study indicates that the scalp could be an ideal source of SSG for the face. It is thick and hair roots lying deeply are excluded. The scalp is an established but occasionally used source for skin grafting, in extensively burnt cases with a paucity of donor areas.<sup>2,7,9</sup>

STSG was done on the face using scalp skin at a thickness of 0.3 to 0.5 mm (Figures 8 and 9). Saturation fell by less than 5% in STSG from the scalp which was barely noticeable visually (Figure 10). There was no noticeable shrinkage of graft or change in texture.

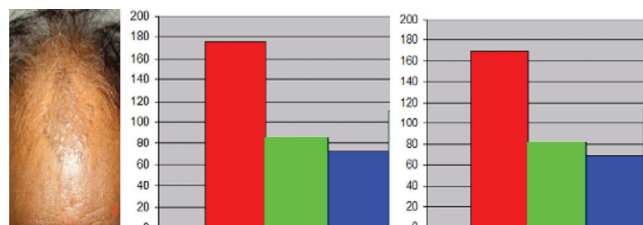
The donor area on the scalp healed in 7 to 10 days without any hair loss.<sup>3,5,6</sup> Recipient areas showed no hair growth, as hair roots situated deeply in the adult scalp had been excluded in the split skin graft.<sup>4</sup>



**Figure 8:** Road side dirt tattooed scar. Deep derma abrasion done and covered with STSG Scalp.



**Figure 9:** Post-trauma exposed zygoma. Crane principle used: applied scalp flap returned. Raw area covered with STSG Scalp. The graft on lower cheek is from the thigh.



**Figure 10:** STSG from scalp is applied to frontal region of face. RGB saturation Graphs before and after 3 months of graft placement. RGB Saturation fell uniformly by less than 5%.

## CONCLUSION

This study presents that digital photography and color analysis software are simple yet precise tools for color analysis and objective color comparison. It eliminates the subjective assessment of colors, human errors, and bias. It was thus objectively possible to determine that the scalp is the best color-matching STSG donor area for the face. The color remained largely unchanged with time. No shrinkage was evident.

Scalp skin was felt to have a good texture match with facial skin. Scalp STSG is available adequately, and could be used for covering large areas of facial skin defects.<sup>8</sup> A similar analysis over a larger population to strengthen the findings is suggested since this was a uniform result observed only in 5 patients.

## CONSENT AND DISCLOSURES

Proper consent for the procedure of skin grafting with full knowledge of the patients for the chosen donor area was obtained in all cases.

This study did not involve any sources of funding and was conducted by a single author alone.

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