

# Hemostatic Net Sutures: A New Solution to an Old Problem

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## ABSTRACT

**Objective:** This research focuses on evaluating the effectiveness of hemostatic net sutures in securing full-thickness skin grafts, aiming to improve graft uptake and minimize complications.

**Methods:** We conducted a prospective study at Fauji Foundation Hospital, Rawalpindi, From July 2022 to December 2023, involving 30 patients who underwent full-thickness skin grafting in the head and neck region and required hemostatic suturing over a period of 1.5 years.

**Results:** The study encompassed 30 full-thickness skin graft reconstructions, with a follow-up period extending up to three weeks. A notable graft take rate of 90% was observed, with half of the cases achieving 100% adherence. The average time for the procedure was approximately 26.7 minutes across an average defect area of 58 cm<sup>2</sup>. Major hematoma formation was observed in only 3% of the cases, with no significant influence of age, sex, or defect area on the graft take rate.

**Conclusion:** Hemostatic net suturing demonstrates its efficacy in ensuring adequate graft adherence while simultaneously minimizing tissue manipulation, reducing surgical time, and lowering complication rates.

**Keywords:** Full-Thickness Skin Graft, facial plastic surgery, Graft Fixation, Hemostatic Net Sutures, Skin Grafting

### Authors' Contribution:

<sup>1,2</sup>Conception; Literature research; manuscript design and drafting; <sup>3,4</sup>Critical analysis and manuscript review; <sup>5,6</sup>Data analysis; Manuscript Editing.

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## Introduction

Skin grafting, a cornerstone technique for addressing skin defects, hinges critically on effective graft fixation. Traditional methods, while prevalent, are often laborious and time-consuming. Emerging as a promising alternative, hemostatic net sutures, initially acclaimed in rhytidoplasty for reducing hematoma, are being repurposed for skin graft fixation. This study seeks to rigorously evaluate the effectiveness of hemostatic net sutures in this new role, hypothesizing their superiority in both graft fixation and hematoma mitigation. The transition from traditional methods, such as the tie-over

bolster dressing, whose limitations in time efficiency and labor-intensiveness have been highlighted by Joyce et al., to more innovative techniques is critical.<sup>1</sup> In 2020, a comprehensive review of literature performed by Steele et al, reported no significant effectiveness of traditional tie over methods in applying adequate pressure over the graft.<sup>2</sup> Auersvald et al. demonstrated the effectiveness of continuous and transfixing sutures in rhytidoplasty, utilizing the hemostatic net to prevent early post-operative hematoma. Pava et al. recently extended this technique to split-thickness skin graft as a single case, proposing a novel

application in this area.<sup>3,4</sup> Given the limited exploration of hemostatic net sutures in skin grafts, this study seeks to fill this gap by evaluating their efficacy in enhancing graft uptake and reducing complications in skin grafting. We hypothesize that hemostatic net sutures offer a less laborious, effective method for graft fixation with reduced hematoma formation.

## Methodology

Following the approval of the institutional review board, dated 8<sup>th</sup> July 2022, with reference number 645/RC/FFH/RWP, this study at Fauji Foundation Hospital, Rawalpindi, focused on patients undergoing skin excision from July 2022 to December 2023, requiring either full thickness (FTSG) or split thickness (STSG) skin grafts for defect coverage. Specifically, excisions from the face, neck, and scalp regions were conducted by consultant plastic surgeons. Demographic data such as age, gender, defect size, and location were meticulously recorded. FTSG for head and neck defects were harvested from post auricular, supra clavicular, pre auricular regions and medial aspect of arm while STSG for neck and scalp defects were sourced from the thigh. The study monitored total operative time for graft fixation, graft adherence, seroma and hematoma formation, and infection at a 5-day mark, with complete graft uptake assessed at 3 weeks. Hematoma was clinically defined as the accumulation of blood beneath the graft with major hematoma labelled as blood accumulation under greater than 15% of the total graft. The study included patients above the age of 12, regardless of lesion etiology, and involved sheet grafting or full-thickness skin grafting for defects not suitable for primary closure or those requiring flap coverage. Patients with comorbidities such as diabetes (HbA1c >6.5), active smoking habits (regular cigarette smoking for > 6 months), acute burn injuries, or those on anticoagulant therapy were excluded from

the study. The hemostatic net technique was meticulously employed in this study. Utilizing Prolene 5.0, a series of continuous and transfixing sutures were strategically placed to effectively eliminate dead space. These sutures were arranged approximately 0.5- 1 cm apart to form a comprehensive net-like structure over the graft area, as illustrated in Figure 1. Post-operatively, all patients received a standard broad-spectrum gram-positive antibacterial cover, intravenously, thrice daily for a duration of five days. The initial dressing was removed on the fifth day, and stitches were extracted accordingly. Topical antibiotic ointment was prescribed, with instructions for twice-daily application over a period of seven days. Antiseptic, medicated tulle gras dressing (Bactigras<sup>o</sup>) was utilized as the initial overlay on the graft, followed by a simple aseptic dressing to ensure optimal wound environment. In this study, statistical computations were conducted with a focus on precision and accuracy. Patient characteristics and other categorical variables were analyzed using frequencies and percentages. For continuous data, medians were calculated to ascertain central tendencies. The Chi-square test was employed to evaluate the significance of associations among discrete variables. Additionally, the independent t-test was applied to explore relationships between numerical datasets. A p-value threshold of <0.05 was established to determine statistical significance. All statistical analyses were meticulously performed utilizing the Statistical Package for the Social Sciences (SPSS, version 23.0, Inc., Chicago, IL). Furthermore, Microsoft Excel 2016 was utilized for the creation of all tables and figures, ensuring clarity and comprehensibility in data presentation.

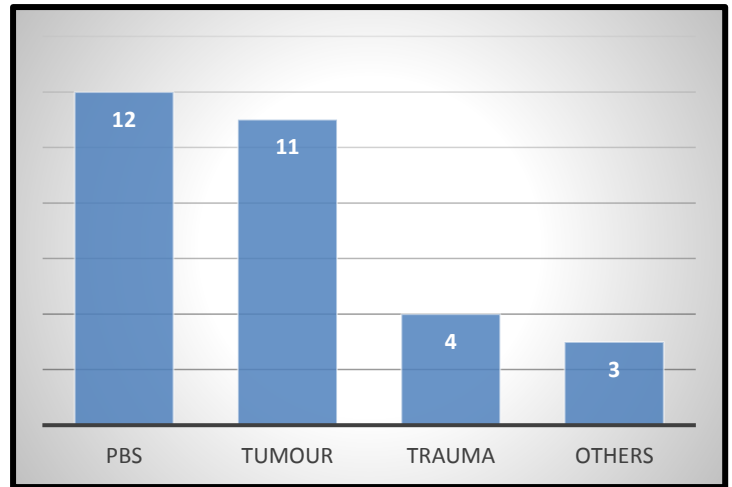
## Results

The study encompassed 30 patients who underwent reconstruction using full thickness skin grafts (FTSG) in the head and neck areas. A significant majority,

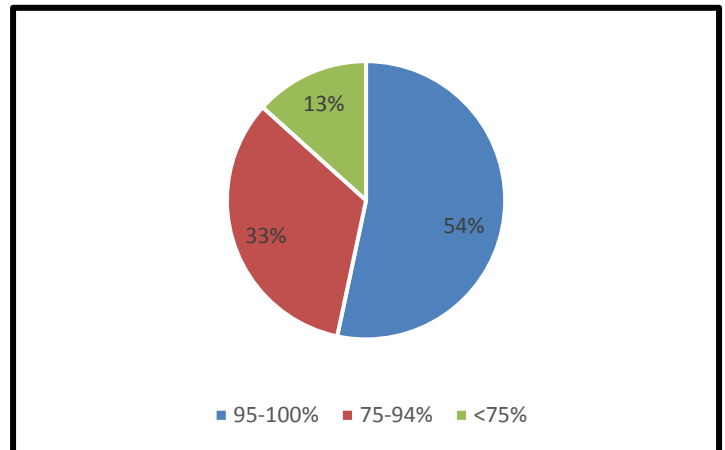
73%, were female, with an average age of 42.4 years (standard deviation: 20.7 years). The size of the surgical defects varied, ranging from 5 cm<sup>2</sup> to 195 cm<sup>2</sup>, averaging at 58.1 cm<sup>2</sup>. A predominant 67% (n=20) of FTSG were applied to facial defects, while scalp and neck reconstructions were less frequent. The patient cohort primarily consisted of individuals with post-burn scarring, predominantly female, followed by those with basal cell carcinoma lesions (36%), trauma (13%), and other conditions including keloid and neurofibroma excisions (Figure 2). The average duration required to secure the FTSG using hemostatic net sutures was approximately 26.93 minutes, with a range of 15 to 45 minutes depending on defect size. Graft adherence significantly differed across gender but not in age groups ( $p= 0.039$ ,  $p= 0.818$ ). The postauricular region was the most common donor site (43%), followed by the supraclavicular (16.8%) and medial arm (13%) areas, with thigh (26%) used for sheet grafts. Notably, 95-100% graft adherence was observed in over half of the cases (54%) (Figure 3). Major hematoma formation was recorded in only three percent of the patients. Instances of seroma and infection at the initial dressing change were relatively infrequent. A high rate of complete graft uptake (90%) was observed after 3 weeks. In a minority of cases (3 patients), graft uptake failure was noted, leading to healing by secondary intention. Statistical analysis revealed significant impacts of defect size and site on graft adherence ( $p= 0.009$ ,  $p= 0.009$ ).



**Figure 1: Hemostatic suture on the neck**



**Figure 2: Nature of Defects**



**Figure 3: Graft Adherence after 5 days**

## Discussion

Split-thickness skin grafting is one of the most commonly performed procedures in plastic surgery, with the literature offering a variety of methods for securing the graft to the recipient bed. Ensuring graft immobility is critical for successful revascularization.<sup>5</sup> Complications such as hematoma, seroma, poor adherence, and graft instability disrupt the natural uptake process, increasing the risk of graft failure and causing significant distress for both surgeons and patients.<sup>6</sup> Over the past decade, studies have compared various techniques, including fibrin glue, staples, tie-over dressings, and vacuum-assisted dressings, to

secure the graft and minimize complications.<sup>2</sup> Despite these advancements, newer methods continue to be explored to further reduce risks and enhance outcomes. One such innovation is the hemostatic net suturing technique, described by Auersvald et al. in the context of rhytidoplasty. This method involves a series of meticulous continuous sutures designed to obliterate dead space, effectively reducing hematoma formation and ensuring precise graft adherence to the recipient bed.<sup>3</sup>

Our comprehensive analysis highlights the significant advantages of hemostatic net suturing in full-thickness skin grafting, addressing several critical challenges in grafting procedures. Notably, this technique demonstrates exceptional effectiveness in reducing hematoma and seroma formation; common complications that often lead to graft failure. These findings align with the work of Auersvald et al. and O'Daniel et al., who employed this technique in facelift procedures to mitigate hematoma development, further confirming the efficacy of hemostatic net suturing in enhancing graft viability.<sup>4,7,8</sup>

Additionally, when compared to traditional methods such as tie-over dressings, fibrin glue, and staples; often criticized for inefficiency, cost ineffectiveness, and the discomfort associated with removal; hemostatic net suturing proves to be a superior alternative.<sup>2,5,6</sup> As noted by Joyce and Steele et al, conventional techniques frequently fail to ensure optimal graft adherence and alignment. In contrast, the hemostatic net suturing technique is not only less labor-intensive but also more effective in maintaining graft stability, a critical factor for successful outcomes.<sup>1,2</sup>

The clinical outcomes further underscore the superiority of this technique. Our study demonstrated a high graft adherence rate, with 90% of cases achieving complete take, consistent with the findings of Harrison et al. This success highlights

the technique's efficacy in graft fixation, a critical component of successful skin grafting.<sup>9</sup>

Additionally, our findings corroborate those of Auersvald et al, particularly regarding the safety and aesthetic benefits of hemostatic net suturing. The use of 5/0 polypropylene sutures minimize hyperpigmentation and reduces scarring, resulting in improved aesthetic outcomes. The enhanced visibility of the graft post-healing, coupled with ease of post-operative care, makes this technique particularly advantageous in reconstructive surgery.<sup>10</sup>

A common criticism of this procedure is the potential for prolonged operating time. However, Janssen et al., based on a five-year experience, reported that applying wide net sutures to the entire face and neck typically takes about 30 minutes, with application times decreasing with experience. Our analysis aligns with these findings, showing an average application time of 15 to 30 minutes, depending on the defect size.<sup>11</sup>

The hemostatic net suturing technique has gained widespread recognition for its effectiveness in reducing hematomas during facelift procedures. Additionally, it has shown promising results in skin draping for procedures such as gliding brow and lip lifts, gynecomastia correction, and enhancing the inframammary fold in breast surgeries.<sup>12,13,14</sup> However, its application in reconstructive procedures, such as skin graft fixation, seroma reduction at latissimus dorsi flap donor sites, and occlusion of dead spaces following open surgeries like abdominoplasty remains underexplored and supported by limited evidence.<sup>2,4,15,16</sup>

Our study highlights a significant advancement in skin grafting techniques. It effectively addresses critical challenges such as hematoma and seroma reduction, provides advantages over traditional methods, ensures positive clinical outcomes, and adheres to high safety and aesthetic standards. These findings represent a notable milestone in the

field of reconstructive surgery, paving the way for broader applications of this technique. While our study provides promising results, the limitations include a small sample size and a single-center design. Additionally, as our study still reported some hematoma and seroma formation, further refinement is needed. This aligns with the observations made by Fausto et al. about the occurrence of these complications even with improved techniques.<sup>8</sup>

Future research, particularly multicenter studies, is essential to validate our findings. Investigating the technique's efficacy in various different body sites and patient populations, especially those with bleeding disorders or on anticoagulants, is a crucial area for future exploration, as suggested by the broader research context provided by studies like those of Pava et al and Harrison et al.<sup>4,9</sup>

## Conclusion

The hemostatic net suture technique, as explored in our study, marks a significant advancement in skin grafting procedures, particularly in the context of reducing hematoma and seroma formation. While our results are promising, they underscore the need for continued research and technique refinement. The potential of this technique to significantly impact the field of reconstructive surgery, especially in complex cases, remains a promising area for future investigation and clinical application

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