

## Skin Graft Harvested from Hypertrophic Scar Tissues as a Treatment Option of Post Burn Popliteal Contracture: A Case Report

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### ABSTRACT

**Background:** Burn injuries can range from minor injury up to life-threatening medical problems. Scars and contractures of varying degrees may develop on a healed burn patient, causing problems in functional and aesthetic components. Surgery is indicated on contracture patients with limited range of motion on the affected limb.

**Aims :** This study aims to report a 33 year old female patient with popliteal contracture following a gas explosion at her home six months ago.

**Case Presentation:** The patient presented with diffused desmogen contracture of the left popliteal with limited range of motion, and hypertrophic scar tissue in some parts of her body, such as the posterior side of both thighs and both lower leg. The patient is unable to walk normally because her left knee cannot be straightened following the burn trauma. Surgical procedure was done to excise the contracture, and split thickness skin graft harvested from the hypertrophic scar of posterior left thigh was used to close the defect.

**Result:** Patient achieved satisfactory result following surgery. The patient demonstrated improved knee function, with the ability to walk normally without assistive device.

**Conclusion:** Closing defect after excision of contracture using skin graft from hypertrophic scar tissue offers the patient a good chance for release contracture without the risk of additional scar tissue.

**KEYWORD:** burn, contracture, hypertrophic scar, popliteal, skin graft

### ARTICLE DETAILS

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### BACKGROUND

Burn injuries are a major health concern worldwide, especially in low- and middle-income countries.<sup>1</sup> Hypertrophic scars caused by an overactive healing process and continuous collagen production and contractures of varying degrees may develop on a healed burn patient, causing problems in functional and aesthetic components.<sup>2</sup> Several factors can influence the risk of developing hypertrophic scars, including the location, depth, skin color, and healing time of burn wounds.<sup>3</sup> Burn-related contractures were first recorded in Ebers' Papyrus around 1500 BC, where copper splints were described as a treatment for burns. A contracture is a condition where a joint cannot move through its full range of motion.<sup>4</sup>

Knee flexion contractures caused by post-burn scars make up about 22% of contractures involving major joints. These contractures significantly limit leg mobility and impair the functionality of the lower limb, often accompanied by visible cosmetic deformities. Surgical intervention is frequently needed to address these issues. In severe cases, extending the knee can cause excessive tension on the scar, potentially resulting in keloid formation or pathological ulceration.<sup>4</sup> Releasing the tissue through incision or excision, combined with skin grafting, is a common initial treatment approach for contracture and often provides outstanding long-term results. This study aims to report the usefulness of skin graft harvested from hypertrophic scar tissue for the management of post-burn popliteal contracture and evaluate

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improvement in function of the knee after skin graft coverage in post-burn popliteal contracture.

## CASE PRESENTATION

A 33-year-old female presented to the plastic surgery outpatient clinic with complaints of impaired walking due to inability to fully straighten her left knee, following a burn injury from a gas explosion at her home six months prior. On examination, there were limited range of motion of the left knee, diffuse contracture of the left popliteal region, along with hypertrophic scar tissue on various parts of the body, particularly on the posterior surfaces of both thighs and both lower legs. This patient presented with functional impairment due to contracture, warranting surgical intervention. Given the severity of the contracture and the impact on knee mobility, surgery was planned to release the contracture and restore functionality.

The patient underwent surgery under spinal anesthesia and was kept in prone position. Preoperative markings were made to outline the contracture and proposed incision sites. During surgery, contracture tissue measuring 13x6x4 cm was excised. A split-thickness skin graft, harvested from the hypertrophic scar on the posterior left thigh, was used to cover the defect.

Patient achieved satisfactory result following surgery. Povidone iodine soaked gauzes dressing were used for post-surgery wound treatment at the donor and recipient site. A foreslab was applied to help immobilize the patient postoperatively, and she was instructed to maintain a prone position, occasionally shifting to the right side. The patient was hospitalized for three days post-surgery and instructed to attend regular follow-up visits at the outpatient clinic to monitor general appearance, knee movement recovery, and donor site healing.

At a two-month follow-up, the patient demonstrated improved knee function, with the ability to walk normally without assistive device. The donor site, previously a hypertrophic scar, healed well with reduced thickness and scarring. The patient was instructed to wear compression garment on the donor and recipient site. The patient was satisfied with the functional and aesthetic outcomes of the procedure.



Figure 1. a,b,c,d,e The poplitea's pre surgical appearance



Figure 2. (a,b) The design scar contracture excision



Figure 3. (a,b,c,d) Contracture tissue excision

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Figure 4. (a,b) Defect after excision, (c,d) Harvesting skin graft



Figure 5. (a,b,c,d,e) Post-operative Result



Figure 6. (a,b,d) 10-days follow up, (c,e,f) 2-months follow-up



Figure 7. (a) Before surgery, (b) After Surgery

### DISCUSSION

Knee is the largest joint in the human body essential for maintaining upright posture and facilitating bipedal movement.<sup>5</sup> Knee flexion contracture are classified into three categories, lateral joint surface (medial or lateral), posterior (popliteal area), or both lateral and posterior together.<sup>6</sup> Surgical correction of flexion contractures in this joint often results in substantial skin defects.<sup>5</sup> Treatment algorithm for covering broad sheet burn contracture of the extremities developed by Hudson et al can be used to determine which treatment option is best for each patient. Treatment options include skin graft, flap, and artificial skin for severe contracture (<50% ROM), and multiple Y-V plasty for mild contracture (>50% ROM).<sup>7</sup> The goal of popliteal reconstruction is to restore the contour and preserve knee.<sup>8</sup> Reconstruction of the lower limb is challenging and requires meticulous consideration because of its limited vascularity

and tendency toward poor wound healing, which can complicate recovery process.<sup>5</sup>

Hypertrophic scars are a type of fibroproliferative skin disorder resulting from abnormal wound healing in the deep dermis, often triggered by injuries such as burns.<sup>9,10</sup> In normal wound healing, the remodeling and maturation process involves the apoptosis of myofibroblasts, typically occurring around 12 days post-trauma. In hypertrophic scars, however, this apoptotic process is delayed, extending to around 19-30 months, resulting in an accumulation of myofibroblasts.<sup>3</sup>

In this case, the contracture tissue was excised. This approach aligns with the findings of Grishkevich and Vishnevsky, who stated that complete excision of all contracture tissue in the popliteal area yields better outcomes compared to merely incising the scar. Skin grafts placed on the defect after excision are less likely to shrink, and the risk

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of recurrent contracture is significantly lower than with scar incision alone, which leaves residual scar tissue prone to contraction. In this case study, the decision to harvest skin graft from the patient's hypertrophic scar tissue was made to minimize additional scar formation of the healthy skin while also reducing the thickness and rigidity of the hypertrophic scar and providing a cosmetic improvement.

This case is similar to a study by Zheng et al., which reported using autologous split-thickness skin taken from scars on patients' backs. The study showed good results, with improved function and appearance at the recipient sites in all cases, and it was noted that the outcomes were comparable to reconstruction using skin grafts from normal skin.<sup>11</sup>

Scar tissue at the posterior thigh is under pressure when in sitting or supine position, which may impede scar proliferation and accelerate scar maturation.<sup>11</sup> This natural compression reduces the risk of excessive scarring and aids in improving the texture and functionality of the affected/donor area. Reconstructing large areas affected by burns using a combination of autologous scar-related tissue, and split-thickness skin grafts from the scalp has also been performed. This approach showed satisfactory functional outcomes in patients with scar deformities in around joints and can be viable option, especially in resource-limited settings.<sup>12,13</sup>

In this case, the patient was instructed to wear a foreslab for one month. The purpose of the foreslab is to help immobilize the patient after surgery, maintain knee extension, and prevent neurovascular injury in the popliteal fossa.<sup>14</sup> The future of burn wound care holds promise, focusing on multi-approach treatments to enhance outcomes, particularly in resource-limited settings.

## CONCLUSION

Closing defect after excision of contracture using skin graft from hypertrophic scar tissue offers the patient a good chance for release contracture without the risk of additional scar tissue and reduce the thickness and rigidity of the hypertrophic scar.

## CONFLICT OF INTEREST

There are no conflict of interest

## DECLARATION OF PATIENT CONSENT

The authors confirm that informed consents (Consent to Participate and Consent to Publish) were obtained for this study.

## DATA AVAILABILITY STATEMENT

The data generated during the current study are available from the corresponding author on reasonable request.

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