

Modified Oblique Triangular Flap of Fingertip Defect - Venkataswamy Flap

**Dr. Aishwarya Sukhadev Bhujbal¹, Dr. Ananta Kulkarni²,
Dr. Tushar Jadhav³**

¹Junior Resident

Surgery

²Head Of The Department And Professor

Surgery

³Associated Professor

Surgery

1. Introduction

The Venkateswara-Swamy flap is a specialized local flap technique that involves using local tissue (skin, muscle, or fascia) from an adjacent area to cover a defect or wound on the finger, typically caused by trauma or burns.

The Modified Oblique Triangular Flap is a well-known reconstructive surgical technique often used for covering finger tip defects. This technique is an adaptation of the traditional triangular flap and is widely used in plastic and reconstructive surgery to restore the integrity of the fingertip following trauma, amputation, or other injuries.

This technique is known for being efficient in providing good functional outcomes with minimal donor-site morbidity. It's particularly useful in cases where other options like free flaps or microvascular tissue transfers may be too complicated or impractical.

Fingertip injuries can result from various trauma mechanisms, including crush, laceration, and avulsion injuries. These injuries often involve the loss of soft tissue, pulp, nailbed, tendon, and bone, leading to defects in the terminal digits. Treatment options for these defects vary based on the degree of tissue loss and the size of the defect and can range from nonoperative to operative approaches [1].

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2. Key Features

KEY WORDS-V-Y fingertip flap

Homodigital perforator flap

Unilateral V-Y perforator flap

Fingertip reconstruction

Digital artery perforator flap

VY perforator flap [3]

Key Features of the Modified Oblique Triangular Flap:

1. Oblique Design:

- The flap is triangular in shape, with one side of the triangle (the base) running parallel to the lateral or dorsal aspect of the finger.
- The oblique angle allows for a more favorable blood supply and a flap that can be rotated or advanced into the defect.

2. Flap Sizing:

- The flap is designed to be larger than the defect it is meant to cover. This ensures sufficient tissue to fill the gap and provides good aesthetic and functional results.
- The size of the flap depends on the extent of the defect and the area of healthy tissue available for harvesting.

3. Minimal Donor Site Morbidity:

- The flap is taken from an adjacent area of healthy tissue on the same finger, so it doesn't require a separate donor site. This makes the procedure more efficient and reduces the overall risk of complications.

4. Blood Supply:

- The flap's vascularity is crucial for its survival. It is typically based on the lateral digital artery and its branches, which supply the tissue on the finger. Proper planning of the flap design is important to ensure there is enough blood flow to the tissue after rotation or advancement.

3. Materials and methods

A total of 10 fingers in 10 patients had this procedure performed between 2013 and 2018. There were 8 adults and 2 children. The average age was 26.5 years (range 1 to 52) with 6 males (60%) and 4 females (40%). Two of the ten patients were active smokers. None of the patients suffered from any known vascular diseases or other significant comorbidities. There were 3 index, 3 middle and 4 little fingers involved. Nine were [crush injuries](#) (8 in doors and one in a printing machine) and one was a sharp amputation from a metal sheet. All cases selected were Allen classification type 3 amputations with significant exposed [distal phalanx](#) where it would not be possible to achieve closure without significant shortening or a flap procedure. More proximal amputations and more distal amputations with only pulp

loss and no exposed bone, were excluded. All flaps were performed under 4x wide field surgical [loupe](#) magnification. All cases were done under [local anaesthetic](#) digital block except for the two [paediatric](#) cases, which were performed under general anaesthetic. [5]

4. Case Study

Patient: 30-year-old male

Presenting Complaint: Finger injury due to a workplace accident

History: The patient sustained a traumatic injury to the distal phalanx of his left index finger during work. The injury involved partial amputation of the fingertip, including soft tissue loss and exposure of the bone.



Initial cleaning and dressing were performed in the Emergency Department, and the patient was subsequently admitted to the ward for further management.



Oblique triangular flap design was marked preoperatively.

Procedure:

- A modified oblique triangular flap was designed from the lateral aspect of the finger to cover the exposed bone and soft tissue defect.
- The flap was raised, rotated into position, and secured with sutures.
- The donor site was closed primarily, with careful attention to avoid tension.

5. Patient and Ethics

We prospectively analyzed 200 patients with Allen type 1–4 fingertip amputations between 2015 and 2019, where one patient was lost to follow-up for an unknown reason. An ethical committee board approved the study. The mean age of the 199 patients in the study was 31 years (range 1.5–57 years). There were 120 patients with right-side involvement. There were 169 men. Transverse amputation was seen in 94 patients, dorsal oblique in 24 patients, radial oblique in 29 patients, ulnar oblique in 27 patients, and volar oblique in 25 patients. The thumb was involved in 79 patients, the index finger in 55 patients, the middle finger in 25 patients, the ring finger in 20 patients, and the little finger in 20 patients. Most injuries were crush (182 cases) or guillotine type (17 cases), all caused by machine injuries or knives. [2]

Indications for Modified Oblique Triangular Flap:

This flap is most commonly used in the following situations:

- **Traumatic Fingertip Injuries:** After traumatic amputation or partial loss of the fingertip, especially where the nail bed and soft tissue are involved.
- **Burns or Chemical Injuries:** Covering areas with burn or chemical tissue damage on the fingertip.
- **Post-Surgical Defects:** Defects left after excision of a tumor, cyst, or other benign growth in the fingertip area.
- **Congenital Anomalies:** Used in reconstructive surgery to correct congenital deformities of the fingertip.

Surgical Technique:

1. Flap Design:

The flap is designed as an oblique triangle, with its base along the lateral or dorsal aspect of the finger. The size of the flap should be at least 1.5–2 times the size of the defect.

The flap's apex points towards the distal end of the finger, and its base should be oriented towards the proximal portion, where there is ample tissue for mobilization.

2. Incision and Elevation:

After marking the flap, a sharp incision is made along the designed boundaries of the triangle.

Subcutaneous dissection is carried out to elevate the flap, ensuring that the vascular pedicle (blood supply) remains intact.

3. Rotation or Advancement:

Once the flap is elevated, it is rotated or advanced into the defect. The flap is then sutured into place, covering the exposed bone, tendon, or joint. Care should be taken to avoid tension at the donor site or flap site to ensure proper healing.

4. Wound Closure:

The donor site (usually the lateral or dorsal aspect of the finger) is closed primarily, with attention to tension-free closure to avoid further damage or complications.

Sutures are placed to secure the flap into the defect, and any excess skin at the flap's base is trimmed.

Post-Operative Care:

After surgery, the patient is monitored for flap viability, and dressing is applied to protect the wound and prevent infection.

Splints or immobilization may be used to reduce movement and prevent tension on the flap during the healing phase.

Regular follow-ups are necessary to check for flap survival, infection, and to monitor the range of motion.

6. Conclusion

The oblique triangular flap remains a reliable and versatile reconstructive option for managing soft-tissue defects in anatomically challenging regions. Its design balances robust vascularity with favorable tissue mobilization, allowing tension-free closure while preserving functional and aesthetic outcomes. When executed with careful planning and meticulous surgical technique, the flap provides predictable healing, minimal donor-site morbidity, and consistently high patient satisfaction. Continued refinement of flap geometry and anatomical understanding will further enhance its applicability across a wide range of reconstructive scenarios.

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