ORIGINAL RESEARCH PAPER
Volume - 13 | Issue - 07 | July - 2024 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A CLINICAL STUDY OF VENOUS FLAPS

Plastic Surgery

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ABSTRACT

Background: Conventional arterial flaps require deep dissection along with sacrifice of an artery which results in morbidity of donor site. Venous flaps consist only of skin, venous plexus, and subcutaneous fat, so are thinner and more pliable. The primary blood supply of these flaps enters and exits the flap through the venous system, i.e. they rely on the venous system alone for flap perfusion. When the local flaps and other conventional flaps are not available, venous flaps are an ideal indication. **Methods:** This was a prospective study conducted in the Department of Plastic & Reconstructive Surgery, Osmania General Hospital, Hyderabad, from August 2021 to July 2023. Patients with soft tissue defects who after evaluation, were appropriate for venous flap cover were included in the study. Patients are analyzed according to age, sex, mode of injury. Outcomes were studied. **Results:** Total of 20 patients were included in this study. Most common presentation was due to road traffic accidents (RTA). Most commonly repaired limb with venous flap in this study was upper one third of leg. Primary flap cover was done in most of the cases(80%). Most common flap cover was Saphenous venous flap in 45% cases followed by pedicled venous flaps based on dorsal veins in 25% cases. Satisfactory and good aesthetic appearance was seen in most cases. **Conclusions:** Depending on the availability of the vessel or the size of the defect, venous flaps can be used widely. In present study, various types of flap cover were adopted to cover the lower-third of leg defects, depending on the nature of the wound. When adequate adjacent tissue sources like cross-finger flaps are not available venous flap offer an excellent option. They are also used to cover hand defects where skin grafts are not always appropriate, local flaps are not always available, and distant pedicle flaps are often too morbid.

KEYWORDS

INTRODUCTION

Venous flaps are defined as a composite flap of skin and subcutaneous veins that relies on the venous system alone for flap perfusion, that is, the primary blood supply enters and exits the flap through the venous system. Unlike conventional arterial flaps, venous flaps do not sacrifice an artery of the donor site nor do they require deep dissection. This results in an easier procedure as well as a decrease in morbidity of the donor site. In addition, they are thinner and more pliable because they consist only of skin, venous plexus, and subcutaneous fat. They can also be transferred simultaneously as a composite flap to reconstruct the defects of affected tendons and vessels.

They are also useful in repair of defects where there is segmental vessel loss. As they depend only on single central vein for survival, they may be more susceptible to venous congestion and ischemia[1]. flaps which survive solely on venous blood flow are called venous flap and by arterial blood flowing through the venous network is arterialized venous flap [2,3]

A good venous network is found at many places in body, this makes virtually no limitation for number of donor sites for venous flaps. Better understanding of the vascular supply allowed for the development of simpler venous flaps, providing more options for the coverage of various defects.

METHODS

This was a prospective study conducted in the Department of Plastic & Reconstructive Surgery, Osmania General Hospital, Hyderabad, from August 2021 to July 2023. Patients with soft tissue defects who after evaluation, were appropriate for venous flap cover were included in the study. Patients are analyzed according to age, sex, mode of injury. Patients who had exposed tendons, bone, requiring flap cover were included in the study.

Patients with polytrauma and those requiring emergency surgical procedures for other conditions were excluded from the study. A total of 20 patients were included in the study.

Wounds treated by primary closure or skin grafting were excluded from the study.

The data of the patients with respect to age, sex and nature of injury

were tabulated. All patients initially underwent an X-Ray of the affected limb and Orthopedic evaluation. Vascular and neurological examination findings were noted.

Contaminated wounds were initially debrided, and regular dressings done until they were deemed fit for flap cover. Fractures requiring orthopaedic intervention prior to flap cover underwent necessary stabilization.

With reconstructive ladder as a guide, the appropriate reconstructive technique was adopted to each patient, with consideration to the nature of the wound and exposed structures. Perforators were identified by hand- held Doppler pre-operatively when required. Patients were operated under general or spinal anesthesia. All patients received comparable post-operative care including antibiotic therapy, anti-edema measures and flap monitoring.

In patients who underwent skin grafting, first-look dressing was done on the 5th post-operative day. Assisted ambulation was allowed wherever possible after the 5th post-operative day and dependent weight-bearing was allowed on the 7th post-operative day in all cases expect those who underwent fracture stabilization.

RESULTS

Of the 20 patients, The age of patients ranged from 20 to 60 years in this study. Common age group affected is between 31 to 40 years (n=7) and 21 to 30 years (n=6) constituting 35% and 30% respectively. Etiology was RTA in 16 cases and electrical burns in 04 cases. 10 patients presented within one week of injury whereas 25% patients presented in 4 weeks.

Table 1: Age Distribution Of Patients In The Study.

Age (years)	No .of patients	Percentage
21-30	6	30%
31-40	7	35%
41-50	3	15%
51-60	4	20%

The most common component exposed is bone

Table 2 : Indication For Flap.

Indication	No. of patients	Percentage
Defect with Exposed bone	14	70%
Defect with surrounding raw area	03	15%
Defect with Exposed tendon	03	15%

In 30 patients bone was exposed, 3 had surrounding raw area and 3 had exposed tendons.

Table 3 Size Of Defect

Size of defect	No.of patients	Percentage
<09cm^2	05	25%
09-15 cm^2	12	60%
>15cm^2	03	15%

The most common size of defect was medium i.e, 09 - 15 cms^2 (60%), followed by small sized defects less than 09 cms^2 (25%) & Large defects greater than 15 cms^2(15%).

Table 4: Types Of Flaps.

Type of flap	No. of patients	Percentage
Saphenous venous Flap	09	45%
Venous flaps based on dorsal veins	05	25%
Cephalic venous flap	03	15%
Arterialized venous flap	03	15%

Table 4: Post-operative Complications.

Complication	No.of patients	Percentage
Nil	15	75%
Flap loss	02	10%
Venous congestion	02	10%
Partial Graft loss	01	05%

The most common complication observed in the post- operative period was flap loss and venous congestion (10% each).

Table 5: Timing Of Flap Cover

Flap cover	No. of patients	Percentage
Primary flap cover	16	80
Delayed flap cover	04	20

The 20 patients underwent procedures as clinically indicated, where most of the patients went under primary flap cover i.e. 80 %, within a week of injury. Only 4 of them underwent delayed flap cover for post electrical burn defects. The etiological indications for venous flap cover in this study showed road traffic accidents to be the most common cause at 80%. In this study the age of the patients varied from 21 years to 60 years with the mean age of 35 years. Common age group affected is between 31 to 40 years and 21 to 30 years which are 35% and 30% respectively. In the series of P. Agarwal et al, most of the patients fall in 20–40 years age group. In this study 85% of those operated were males while other studies like P. Agarwal et al have quoted it as 100% . Male to female ratio is 17: 3(M = 17, F = 3). Most patients presented with injury on the upper 1/3rd of the leg (45%).

The most common indication for flap cover was exposed bone (70%) which is the same in other studies as well.[1] The most common size of defect was medium i.e, 9-15 cms2 (60%), followed by small sized defects (25%) and 15% with defect > 15 cms2. The most commonly performed procedure is the saphenous venous flaps(45%) followed by venous flap based on dorsal veins (25%). Saphenous flap is the most common procedure performed for leg defects (45%). Pedicled venous flap was done for small defects over fingers. One free flap was done during this period for post traumatic defect of hand of 6*4 cm square.

DISCUSSION:

The Nakayama et al performed first experimental study on the arterialized venous flap[3]. In arterialized venous flap, due to presence of a relative excess of arterial blood inflow for one venous drainage, flaps could become congested and may die. Inada et al., found that two venous exits were more effective than one for this problem [4]. They concluded that flap size is important determinant for its survival. Exact physiology of survival of venous flap is an area of controversy. Three theories which were proposed for survival of venous flap were – Reverse shunting, reverse flow, capillary bypass. Perivenous areolar tissue is vital to the survival of venous flaps[5]. Other studies showed that the profuse venous network in flow-through venous flaps and early invasion of new blood vessels are the mainstays of venous flap survival.[6]

Our study was a prospective study which included 20 patients who underwent reconstruction with venous flap for various defects during the study period from August 2021 to July 2023.

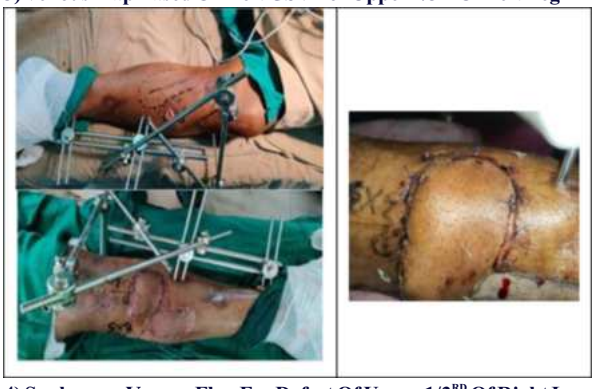
Etiological Incidence

1. Road Traffic Accident - 16 patients
2. Electrical burns - 04

1) Saphenous Venous Flap For Upper 1/3RD Of Right Leg

2) Cephalic Venous Flap For Defect For Defect Over Right Elbow

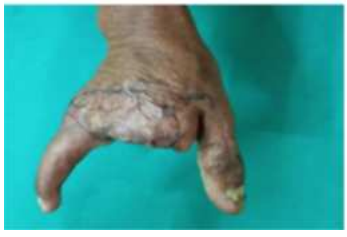
3) Venous Flap Based On Left GSV For Upper 1/3RD Of Left Leg



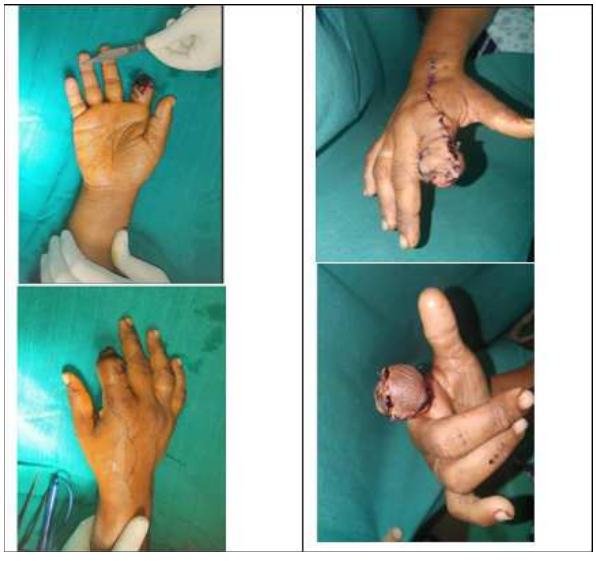
4) Saphenous Venous Flap For Defect Of Upper 1/3RD Of Right Leg

5) Free Venous Flap Based On Short Saphenous Vein Of Opposite Leg

6) Free Venous Flap For Post Traumatic Defect Of Hand



7) Pedicled Venous Flap For Defect Of Tip Of The Thumb



CONCLUSION

Complication rates were less with venous flap and we can revascularize and resurface the defect in a single stage, they serve as a good alternate for an arterial flap where dissection is cumbersome and where we cannot afford to sacrifice an artery. They can also be harvested including composite tissues such as tendon and nerves. Early wound healing, decreased incidence of infection, short duration of hospital stay and less morbidity are seen with primary flap cover within 1 week. In hands and fingers, especially when the local flaps and other conventional flaps are not available, they can serve as an ideal indication for the repair of soft tissue defects.

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