

# OUTCOME OF WOUND COVERAGE AROUND ANKLE JOINT WITH SURAL ARTERY FLAP

Naseer Ahmed Ch,<sup>1</sup> Muhammad Javed Khan,<sup>2</sup> Asghar Ali Ch,<sup>1</sup> Muhammad Zafar Iqbal,<sup>1</sup> Muhammad Shahid Riaz<sup>1</sup>

## ABSTRACT

**Background:** Trauma is the most common cause of fractures and majority of these fractures involve the foot. So the early coverage is mandatory to prevent the complications, it is challenging to the orthopaedic, plastic and reconstructive surgeons. Sural artery reversible flap is one of the options. **Objective:** To determine the outcome of sural artery flap for wound coverage around ankle. **Methodology:** A total of 24 patients were included in this interventional study. All the patients having wound around the ankle due to any cause and of either sex presenting in emergency department of Sheikh Zayed Medical College/Hospital, Rahim Yar Khan from 1<sup>st</sup> June 2014 to 30<sup>th</sup> April 2016 were included in this study. Outcome was measured as “Good”, “Fair” and “Poor”. The data was entered and analyzed by using SPSS version 16. **Results:** In this study 24 patient were operated, 41.66% were children and 54% were male. In 50% heel region was involved and in 25% melleolar region and 12.5% dorsum of foot and in 12.5% above ankle joint. Outcome noted was “Good” 83.3% “Fair” 8.3% and “Poor” 8.3%. **Conclusion:** Sural artery flap for the coverage around ankle is simple, safe and can be performed by orthopedic surgeon at any center without the requirement of special instrumentation and special test, with good outcome.

**Key Wards:** Wound, Ankle, Sural flap.

JSZMC 2016;7(2):942-945

## INTRODUCTION

Road Traffic accident (RTA) is one of the most common cause of injury to the foot and out of that more than seventy percent has open fractures.<sup>1</sup> The defect as a result of injury around the foot and ankle often present challenging problem to the treating surgeon. Tendon and bones are frequently exposed after trauma.<sup>2</sup> The challenge of soft tissue reconstruction have been a matter of increasing interest to the treating surgeon and stimulated the continues search, innovation and modification of various reconstructive modalities in a trial to reach and algorithm to adhere to an ideal option.

Inferiorly based muscle flaps continues to be plagued by a high failure rate due to their variable vascular anatomy distally.<sup>2</sup> Reversed island flaps such as the perforator artery flap,<sup>3</sup> anterior tibial artery flap,<sup>4</sup> and posterior tibial artery flap can be transferred as reconstructive options for the coverage around ankle.<sup>5</sup> The cross-leg flaps are still more limited be-cause of their positional constraints and limitations.<sup>6</sup> The medial and lateral malleolar flaps may be used, but it presents limitations relative to its dimensions.<sup>7</sup>

The option of fascial and fasciocutaneous flaps of the distal pedicle already been intensively

researched.<sup>7</sup> The superficial sural artery, which from the posterior tibial artery, travels with the sural nerve in the proximal leg.<sup>8</sup>

In addition to the vascular network, peroneal artery septocutaneous perforators also anastomose with the superficial sural arterial network within the distal two-thirds of the leg.<sup>9</sup> The close proximity between the deep vessel axis of the sural nerve and its corresponding peroneal and sural arteries accounts for the logic behind the transfer and subsequent survival of the flap.<sup>10</sup> In more understandable terms, the venous network of the superficial sural vein, the short saphenous vein, and the associated veins of the peroneal artery provide the venous return for the flap.<sup>11</sup> This study was planned to determine the outcome of sural artery flap for wound coverage around ankle.

## METHODOLOGY

This interventional study was conducted in the Orthopaedic Department of Sheikh Zayed Medical College/Hospital, Rahim Yar Khan from 1<sup>st</sup> June 2014 to 30<sup>th</sup> April 2016. All the patients presenting in the Orthopaedic emergency department of Sheikh Zayed Medical College/Hospital, Rahim Yar Khan with road side accident of lower limb were included

1. Department of Orthopaedic, Sheikh Zayed Medical College/Hospital, Rahim Yar Khan, University of Health Sciences Lahore, Pakistan.  
2. Department of Orthopaedic, Quaid-e-Azam Medical College, Bhawalpur, University of Health Sciences Lahore, Pakistan.

### Correspondence:

Dr. Naseer Ahmad Ch., Assistant Professor, Department of Orthopaedic, Sheikh Zayed Medical College/Hospital, Rahim Yar Khan.

E-mail:ali.orthopaedic.ryk@gmail.com

Received: 07-04-2015

Accepted:14-05-2016

in this study irrespective of age and sex. Patient presenting with wounds around foot due to diabetes, peripheral vascular disease and tumour were excluded from the study.

All the patients were received in the emergency department and admitted. Resuscitation of all the patients was done with standard protocol. Wounds were immediately treated with compression dressing. Laboratory investigations like blood complete examination and blood grouping were sent. Radiological examination of the involved and other needed parts were performed. Blood transfusion as required was done. Antibiotics were started on empirical basis and tetanus prophylaxis was carried out.

Improvement in general condition of patients was monitored clinically. All the patients were prepared for emergency surgery on priority basis. The outcome of flap was labelled as; "Poor" when these was complete loss of flap; "Fair" when these was superficial skin layer necrosis; "Good" when there was normal skin color and texture and there was no necrosis and congestion. Preoperative and postoperative photographs were retrieved and recorded. Data was analyzed by using SPSS version 16.

#### **Surgical Technique:**

Preoperatively we confirmed the vessel patency by palpating the posterior tibial artery and dorsalis pedis. Once the soft tissue was ready for coverage, the surgical procedure was performed under general / spinal anesthesia in prone position under tourniquet control without exanguination of limb.

The dissection started with transverse incision in the pivot point and at longitudinal point on the pathway of the sural nerve after defining the nerve, artery and vein. Then proceeded in the proximal direction to dissect the flap which was already marked according to the size of the wound.

The flap was raised and the sural nerve and associated structures identified. The deep-fascia was tagged with skin with 2/0 vicryl as stay suture then the flap was detached with deep-fascia from proximal to distal direction with a wide pedicle of 4-6cm up to the pivot point of rotation.

Then the tourniquet was released to confirm the vascularity through bleeding from the flap was and the colour and the texture of the flap. After confirming vascularity the flap was shifted

through skin incision without tunneling.

Here the flap was set over defect with 2/0 prolene after placing the suction drain underneath. The drain was extruded though the planter surface of the foot.

In some patient at donor site Split Thickness Skin Grafting (STSG) was done at the time of surgery and in others patients STSG was delayed. A modified cast was applied to remove the pressure at the flap. Intravenous 1<sup>st</sup> generation cephalosporins were given for three days and then patient was shifted to an oral antibiotic for another one week.

On the next day dressing was removed and flap was observed to assess the viability of the flap. Later on we monitored the flap survival clinically based on skin color, temperature, skin turgor, capillary refill and in doubt full cases colour of blood on pin prick. Assessment were done daily up to three days and the drain removed on the third day and the patient was discharged after educating about flap care and review in the outdoor after ten days for removal of stitches. The range of motion started at the early stages with modified Plaster of pairs, partial weight bearing started after three weeks and full weight bearing started after six weeks.

#### **RESULTS**

In this study, out of total 24 patients, regarding cause of injury, 41% has history of wheel spoke, 37.3% Road Traffic Accident, 8.3% History of fall and farm yard injury in 12.5%.

**Table I: Cause of injury**

Cause of Injury	No	% age
Wheel Spoke	10	41.66%
Road Traffic Accident	9	37.5%
History of fall	2	8.33%
Farm Yard	3	12.5%

In this study, 24 patients were operated for the coverage of wound around ankle out of total patients admitted in orthopedic ward through emergency for the period of 22 months. 54% patients were males.

Among 24 patients, two (8.33%) flaps completely lost due to unknown reason and the defects were managed by the secondary procedures and in two (8.33%) patients there were only superficial skin layer necrosis and these patients were managed by simple skin grafting. In 20 (83.33%) patients have

flaps with normal color and texture with no skin necrosis and venous congestion.

**Table II: Outcome of sural artery flap around ankle**

Outcome	No.	Percentage
Good	20	83.33%
Fair	2	8.33%
Poor	2	8.33%

In 12 (50%) patients wound was in the heel region with exposed tendo-achillis, 06 (25%) patients with wound in the malleolar region and 03 (12.5%) patients in dorsum of foot and 03 (12.5%) patients with wound above the ankle joint.

## DISCUSSION

Road traffic accident (RTA) is most common cause of injury to the foot and most of them are open. It is a challenging problem to orthopedic and even plastic and reconstructive surgeon.<sup>12</sup> The planter soft tissue have unique functional properties integrated with biomechanics weight bearing that allow them to resist external stress and protect the architecture of soft tissues. So replacement require whose physical properties are similar to those of that were lost especially in heel area.<sup>13</sup> Now a days there has been a shift in the approach for the treatment of soft tissue defect, favoring non micro-vascular flaps to time consuming and tedious free flaps. The advent of reliable, robust and least technically demanding distally based sural artery flap has allowed covering small and moderate sized soft tissue defects in the distal one third of leg, which previously were considered as territory for a micro-vascular flap.

Masquelet et-al,<sup>8</sup> described distally based sural artery flap. In present series among 24 patients, there were 10 children and 8 adult male patients. and six adult female patients. In children patient the site of wound was at heel region and the mechanism of injury was spoke wheel injuries. The reason was motorcycle and bicycle commonly used in South Punjab. In these vehicles the injury mainly effects the heel region resulting skin avulsion flap from heel with or without exposing the tendo-achillis.

In the present study there were two patients the in which the complete necrosis of flap developed. Infection was not detected in any patient. We

believe these results can be explained that easier approach of the flap with wider area of pedicle to the recipient site results in less tension to the flap. More over perforators from the peroneal artery allowed arc of rotation greater than 5cm. So these results were comparable with national and international series which was carried out at different centers.

Jeng et al, used distally based sural flap on 22 patients for the coverage around ankle. Twenty had complete success with two minor complications that were treated uneventfully.<sup>14</sup> Huisinga et al used distally based sural flap in 15 patients for soft tissue coverage in the ankle region, 12 flaps survived, two partially survived and one flap failed due to persistent infection.<sup>15</sup> Almeida et al performed a reverse flow flap on 71 patients in which 15 flaps partially necrosed and three experience total loss.<sup>16</sup> Fraccalvieri et al, described their experience with 18 distally based superficial sural flaps in which only one superficial necrosis had to be surgically revised.<sup>17</sup> Sing and Naasan used the reverse sural artery flap to treat acute open fractures of the lower leg associated with soft tissue loss. Two out of seven patients had a partial necrosis of the distal tip of the flap.<sup>18</sup> In comparative study of 50 patients complication were 6/22 and 5/28 in pedicle and free flap group respectively.<sup>19</sup>

## CONCLUSION

This study showed that reverse sural artery flap is better option for the coverage of wound around ankle joint because it is easy to perform less time consuming, and with less morbidity, the advantage is that it can be performed by any orthopaedic surgeon at any center without any help from plastic surgeon or reconstructive surgeon.

### Conflict of interest:

There is no conflict of interest among all authors.

## REFERENCES

1. Dhillon MS, Aggarwal S, Dhatt S, Jain M. Epidemiological pattern of foot injuries: preliminary assessment data from a tertiary hospital. *J Postgrad Med Edu Res.* 2012;(46): 144-147.
2. Hughes LA, Mahoney JL. Anatomic basis of local muscle flaps in the distal third of the leg. *Plast Reconstr Surg* 1993;92:1144-54.
3. Yoshimura M, Imura S, Shimamura K, Yamauchi S, Nomura S. Peroneal flap for reconstruction in the



- expremitry preliminary report. *Plast Reconstr Surg* 1984;74:402-409.
4. Wee JT. Reconstruction of the lower leg and foot with the reverse-pedicled anterior tibial flap: preliminary report of a new fascioutaneous flap. *Br J Plast Surg* 1986; 39:327-337.
  5. Hong G, Steffens K, Wang FB. Reconstruction of the lower leg and foot with the reverse pedicled posterior tibial fasciocutaneous flap. *Br. J Plast Surg* 1989; 42:512-516.
  6. Mooney J.F., De Franzo A, Marks MW. Use of cross-extremity flaps stabilized with external fixation in severe pediatric foot and ankle trauma and alternative to free tissue transfer. *J Pediatr Orthop.*, 1988; 1:26-30.
  7. Koshima I, Itoh S, Nanba Y, Tsutsui T, Takahashi Y. Medical and lateral malleolar perforator flaps for repair of defects around the ankle. *Ann Plast Surg* 2003;6: 579-583.
  8. Masquelet AC, Romana MC, Wolf G. Skin island flaps supplied by the vascular axis of the sensitive superficial nerves: Aatomic study and clinical experience in the leg. *Plast Reconstr Surg* 1992;89:1115-1121.
  9. Dolph JL. The superficial sural artery flap in distal lower third extremity reconstruction. *Ann plast Surg* 1998; 40:520-522.
  10. Nakajima H et al. Accompaing arteries of the cutaneous veins and cutaneous nerves in the extremities: anatomical study and a concept of the venoadipofascial and/or neuroadipofascial pedicled fasciocutaneous flap. *Plast Reconstr Surg* 1998;102:779-791.
  11. Dhilon MS, Aggarwal S, Dhatt S, Jain M. Epidemiological pattern of foot injuries: Preliminary assessment data from a tertiary hospital. *J Postgrad Med Edu Res.* 2012;(46):144-147.
  12. Bhandari PS, Bath AS, Sadhotra LP. Management of soft tissue defects of the ankle and foot. *MJAFI* 2005;(61):215-220.
  13. Chang SM, Zhand K, Li HF et al. distally based sural fasciomyocutaneous flap: anatomic study and modified technique for complicated wounds of the lower third leg and weight bearing heel. *Microsurgery.* 2009;29(3):205-213.
  14. Jeng SF, Wei FC. Distally based sural island flap for foot and ankle reconstruction. *Plast Reconstr Surg* 1997;(99):744-750.
  15. Huisinga RL, Houpt P, Dijkstra R, Storm Van LJB. The distally based sural artery flap. *Ann Plast Surg* 1998;(41):58-65.
  16. Almeida MF, Robero DCP, Okawa RY. Reverse flow island sural flap. *Plast Reconstr Surg* 2002;(109):583-591.
  17. Fraccalvieri M. Verna G, Dolcet M. The distally based superficial sural flap: our experience in reconstruction the lower leg and foot. *Ann plast surg* 2000;45;32-39.
  18. Sing S, Naasan A. Use of distally based superficial sural island artery flaps in acute open fractures of the lower leg. *Ann Plast Surg* 2001;47:505-510.
  19. Khurram MF, Ahmad I, Nanda M. Soft tissue reconstruction of foot and ankle defects: Free Vs pedicled Flaps with the use of 6 different flaps in 50 cases of road traffic accidents. *JN Med Colleg, India,* 2014;1 (7):1031-1038.