

# Comparison of Anatomically of Medial Plantar Flap versus Reverse Sural Fasciocutaneous Flap in the Treatment of Skin Defects After Cutaneous Squamous Cell Carcinoma Excision

Comparación Anatómica del Colgajo Plantar Medial *versus* el Colgajo Fasciocutáneo Sural Inverso en el Tratamiento de Defectos de la Piel Después de la Excisión del Carcinoma Cutáneo de Células Escamosas

Jian Guan<sup>1</sup> & Renyi Liang<sup>2</sup>

GUAN, J. & LIANG, R. Comparison of anatomically of medial plantar flap versus reverse sural fasciocutaneous flap in the treatment of skin defects after cutaneous squamous cell carcinoma excision. *Int. J. Morphol.*, 42(3):631-637, 2024.

**SUMMARY:** To compare the advantages and disadvantages of reverse sural fasciocutaneous flap (RSFF) versus medial plantar flap (MPF) in the treatment of skin defects after excision of squamous cell carcinoma (SCC) of the heel. The research participants were 80 SCC patients admitted to Lishui People's Hospital between January 2019 and April 2022, who were assigned to RSFF group (n=37) and MPF group (n=43) according to the flap type. After a one-year follow-up, the survival, flap necrosis and ulceration, as well as pain and tactile sensation recovery of both groups were counted. At the last follow-up, the clinical response was evaluated, and Short-Form 36 Item Health Survey (SF-36) and appearance satisfaction surveys were conducted. No patients died in either group, and one patient in each group developed flap necrosis. The MPF group had better sensory recovery and a lower incidence of flap ulceration (P<0.05). No notable inter-group differences were identified in clinical efficacy and SF-36 scores (P>0.05). The cosmetic satisfaction was higher in MPF group than in RSFF group (P<0.05). MPF contributes to beautiful appearance, better sensory recovery, and low risk of long-term ulceration, while RSFF is suitable for lesions with large defects or those located at the lateral heel.

**KEY WORDS:** Medial plantar flap; Reverse sural fasciocutaneous flap; Squamous cell carcinoma; Excision surgery; Skin defects.

## INTRODUCTION

Clinically, cutaneous squamous cell carcinoma (SCC) is a very common skin tumor, accounting for more than 30 % of non-melanoma skin tumors (Waldman & Schmults, 2019) (Fig. 1). According to epidemiological surveys by the World Health Organization (WHO), the current incidence of SCC worldwide is about 29.4 %, and is increasing at a rate of 3-10 % per year (Corchado-Cobos *et al.*, 2020). SCC has a predilection for men and is more likely to develop in people over 60 years old (Gutzmer *et al.*, 2019). The main threat of SCC is that it can be metastasized to organs throughout the body through blood circulation, causing other malignant lesions and endangering patients' life safety (Hedberg *et al.*, 2022). The disease can occur in all parts of the body, among which foot SCC, which occupies approximately 20-30 % of all SCC cases, is a very common type in clinical practice (Chang *et al.*, 2022). At present, surgical excision is still the most direct and effective method to treat SCC; however, it is necessary to remove all SCC

and squamous cells of the subcutaneous lesions during the procedure, which will seriously damage the integrity of skin (Bander *et al.*, 2019). While the foot and ankle have a special structure, which is prone to skin necrosis after trauma and surgery, resulting in skin and soft tissue defects, exposure of blood vessels, nerves, bones, and tendons, etc.; moreover, the wound is often unhealed for a long time, causing great damage to the local function of patients (de Jong *et al.*, 2022). Therefore, for foot SCC, it is usually necessary to replace the skin defect after SCC excision with a free flap (Knackstedt *et al.*, 2021).

The skin grafted with free skin graft is very thin, which is not wear-resistant and pressure-resistant and lacks sensory protection, resulting in the predilection for ulceration and infeasibility for repairing heel defects (Simonacci *et al.*, 2018). At present, adjacent pedicled skin flaps are widely used in clinical repair, with reverse sural fasciocutaneous

<sup>1</sup> Zhejiang University of Traditional Chinese Medicine, Hangzhou, China.

<sup>2</sup> Department of Tumor Radiotherapy and Chemotherapy, Lishui People's Hospital, Lishui, China.

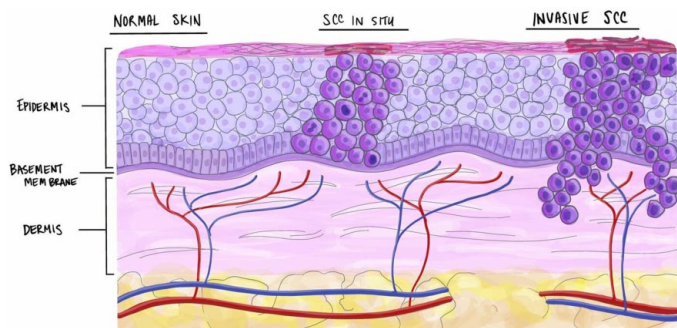


Fig. 1. Schematic view of squamous cell carcinoma.

flap (RSFF), medial plantar flap (MPF), *fibular* artery perforator flap and reverse-flow posterior tibial artery island flap being the commonly used ones (Langat *et al.*, 2021; Clivatti *et al.*, 2022). Yet, there are currently no uniform clinical guidelines, with a great controversy about the optimal flap selection.

Therefore, the purpose of this study is to compare the advantages and disadvantages of RSFF versus MPF in repairing skin defects after heel SCC excision, so as to provide evidence for future clinical SCC surgery and a more reliable guarantee for patients' prognosis.

## MATERIAL AND METHOD

**Patient data.** This study selected 80 SCC patients admitted to Lishui People's Hospital between January 2019 and April 2022 and assigned them to RSFF group (n=37) and MPF group (n=43) according to the types of flaps. The donor site of the flap in RSFF group was directly sutured or grafted with a split- or full-thickness skin graft, while the donor site of the flap in MPF group was transplanted with a split- or full-thickness skin graft. Written informed consent was obtained from each subject involved after this study was approved by the Research Ethics Committee of our hospital.

### Criteria for patient enrollment and exclusion

**Eligibility criteria:** Patients diagnosed as SCC by pathological biopsy in our hospital, met the surgical

indications for SCC (Firnhaber *et al.*, 2020) and underwent surgical excision in our hospital, with the American Joint Committee on Cancer (AJCC) stage II or III, no retroperitoneal, lung, liver, brain and other distant metastases, and the onset area located at the heel were included. Exclusion criteria: Pregnant and lactating patients; patients with other skin lesions; referrals who can't complete the follow-up investigation; patients with poor treatment compliance.

**Surgical procedures.** All patients underwent SCC excision by the same surgical team in our hospital. The surgical margin was determined according to the thickness of the primary lesion, with a surgical margin of 1 cm, 1-2 cm, and 2 cm for those with a lesion thickness of <1 cm, 1-2 cm, and  $\geq 2$  mm, respectively. The depth of resection was up to the surface of calcaneus, and the maximum diameter of skin defect after resection was recorded. The patient was placed in a prone position and the required flap was designed according to the morphology of the soft tissue defect in the heel area. RSFF: About 5 cm above the ankle was selected as the flap rotation point, and the small saphenous vein and sural nerve were ensured to be located in the center of the flap. Next, the skin of the lower leg was incised to determine the location of the main supply vessels of the pedicle, and the subcutaneous superficial fascia was separated. The proximal and bilateral skin were then incised to the deep sub-fascial space. Under the premise of protecting the fascia layer, the flap was dissociated, the small saphenous vein was severed, and the superficial sural artery accompanying the sural nerve was ligated. The separated flap included blood vessels, small saphenous vein, sural nerve and so on. The flap was then grafted to the defect and sutured, and the blood supply was checked. Finally, the donor site of the flap was pressurized and wrapped with a split- or full-thickness skin graft (Fig. 2). MPF: The top of the arch of the foot was taken as the center of the flap, and the tibial margin of the first metatarsal bone and the highest point of the tubercle of scaphoid bone were used as the axis of the flap. The flap size was controlled within 5 cm. First, the skin was cut from the dorsal edge of the flap to the upper edge of the abductor hallucis, which was then pulled to the plantar side. The



Fig. 2. Flow of RSFF surgery. Incision of the flap → isolation of the fibular nerve and accompanying trophic vascularized tip → flap transfer to cover the wound.



Fig. 3. Flow of MPF surgery. Designing the medial plantar flap → cutting the flap → flap transfer to cover the trauma and medial plantar skin grafting.

remaining edges of the flap were incised after the musculocutaneous perforator of the superficial branch of the medial plantar artery was isolated. Then, the medial plantar artery and vein were separated from the lateral artery branch, and the medial plantar branch of the saphenous nerve was found and freed proximally, so that it could be included in the flap, followed by complete free of the flap and suture of it to the defect. The donor site of the flap was grafted with a split- or full-thickness skin graft (Fig. 3).

**Prognostic follow-up.** All patients received a one-year follow-up through regular review conducted once every three months. The one-year survival and rehabilitation of patients were analyzed, including flap necrosis, flap ulceration, and pain and tactile sensation recovery (the recovery of both pain and tactile sensation is regarded as good sensory recovery).

**Efficacy determination.** Efficacy was determined at the last follow-up visit (Claveau *et al.*, 2020). Marked response: Excellent skin healing, good motor and sensory functions, free movement, and no complications. Response: The skin heals well, and the motor and sensory functions are restored, but the movement is somewhat inconvenient, with few complications. Non-response: The skin has not healed and there are many complications. Overall response rate (ORR) = (marked response+response) cases/total case number × 100 %.

**Scoring surveys.** Patient's quality of life was investigated at the last follow-up using the Short-Form 36 Item Health Survey (SF-36) (Lins & Carvalho, 2016) from the dimensions of physical functioning (PF), role-physical (RP), bodily pain (BP), general health (GH), vitality (VT), social

functioning (SF), role-emotional (RE), and mental health (MH), with higher scores indicating better quality of life. In addition, patients' satisfaction with appearance was surveyed, using an anonymous scoring survey (10-point scale): 10 points: very satisfied; 7-9: satisfied; 4-6: reluctantly accepted; 0-3: not satisfied. Total satisfaction = (very satisfied + satisfied) cases/total cases × 100 %.

**Statistical methods.** Statistical analyses were carried out by SPSS24.0 software, and differences were considered statistically significant when  $P < 0.05$ . Categorical variables, expressed in the form of (%), were analyzed by the chi-square test. Continuous variables, represented by ( $\bar{x} \pm s$ ), were compared between groups with the independent samples t test. Patient survival was calculated and compared using the Kaplan-Meier method and the Log-rank test, respectively.

## RESULTS

**Comparison of clinical baseline data.** Comparing patients' age, sex, AJCC staging and other baseline data between RSFF and MPF groups, we found no notable differences between them ( $P > 0.05$ ). However, when comparing the maximum diameter of the lesions between the two groups, the RSFF group was larger than the MPF group ( $P < 0.05$ ) (Table I).

**Comparison of survival.** All participants were successfully followed during the 1-year follow-up, and no cases died in either group, with no statistical difference in 1-year overall survival ( $P > 0.05$ ).

Table I. Comparison of clinical baseline data.

Group	n	Age	Maximum diameter of lesion (cm)	Sex		AJCC staging		Family history of disease	
				male	female	II	III	yes	no
RSFF group	37	59.38±5.48	6.91±2.32	27 (72.97)	10 (27.03)	20 (54.05)	22 (51.16)	2 (5.41)	35 (94.59)
MPF group	43	58.58±8.02	5.95±1.40	29 (67.44)	14 (32.56)	17 (45.95)	21 (48.84)	4 (9.30)	39 (90.70)
$\chi^2$		0.510	2.275		0.290		0.067		0.435
P		0.611	0.026		0.590		0.796		0.509

Table II. Comparison of rehabilitation.

Group	n	Flap necrosis	Flap ulceration	Recover well		
				Pain and tactile	Only in pain	Only in tactile
RSFF group	37	1 (2.70)	5 (13.51)	30 (81.08)	2 (5.41)	5 (13.51)
MPF group	43	1 (2.33)	0 (0.0)	41 (95.35)	1 (2.33)	1 (2.33)
$\chi^2$		0.012	6.198	4.055		
P		0.914	0.013	0.044		

Table III. Comparison of clinical efficacy.

Group	n	Marked response	Response	Non-response	ORR
RSFF group	37	15 (40.54)	17 (45.95)	5 (13.51)	86.49
MPF group	43	18 (41.86)	20 (46.51)	5 (11.63)	88.37
$\chi^2$					0.065
P					0.799

**Comparison of rehabilitation.** During the one-year follow-up survey, one patient in MPF group and one patient in RSFF group developed skin flap necrosis, which healed after skin re-grafting and recovered normally. In MPF group, 95.35 % recovered well in pain and tactile sensation, 2.33 % recovered well only in pain sensation and 2.33 % recovered well only in tactile sensation. In RSFF group, 81.08 % of the patients recovered well in pain and tactile sensation, while 5.41 % and 13.51 % recovered well in pain sensation and tactile sensation, respectively. The inter-group comparison revealed better sensory recovery in MPF group compared with RSFF group ( $P < 0.05$ ). In addition, no patients in the MPF group developed flap ulceration, compared with 5 patients in the RSFF group. The incidence of flap ulceration was higher in MPF group than in RSFF group ( $P < 0.05$ ) (Table II).

**Comparison of clinical efficacy.** The ORR was 86.49 % in RSFF group and 88.37 % in MPF group, with no statistical difference ( $P > 0.05$ ; Table III).

Comparison of quality of life. The SF-36 scoring results showed no statistical difference between the two groups in various fields ( $P > 0.05$ ), indicating that both surgical procedures can effectively improve patients' quality of life (Fig. 4).

Comparison of appearance satisfaction. The appearance satisfaction survey showed an overall satisfaction of 88.37 % in MPF group and 70.27 % in RSFF group. The comparison of appearance satisfaction revealed a higher overall satisfaction in MPF group compared with RSFF group ( $P < 0.05$ ; Table IV).

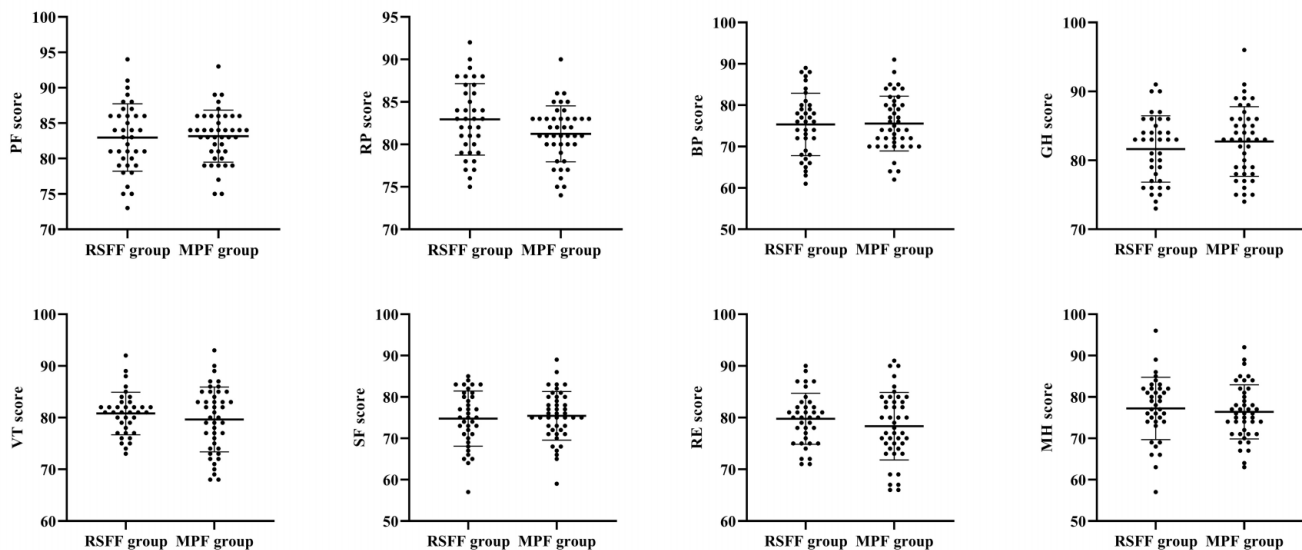


Fig. 4. Comparison of SF-36 scoring results.

Table IV. Comparison of appearance satisfaction.

Group	n	Very satisfied	Satisfied	Reluctantly accepted	Not satisfied	Total satisfaction
RSFF group	37	10 (27.03)	16 (43.24)	7 (18.92)	4 (10.81)	70.27
MPF group	43	16 (37.21)	22 (51.16)	4 (9.30)	1 (2.33)	88.37
$\chi^2$						4.073
P						0.044

## DISCUSSION

Recent years have witnessed the rising incidence of SCC and the increasing application of surgical excision (Villani *et al.*, 2022). There are many kinds of skin flaps used to repair defects after heel SCC excision, with a high survival rate (Winge *et al.*, 2023), mainly including local pedicled transposition flaps and free skin flaps (Le Guern *et al.*, 2021). Compared with the former, the latter has no advantage in postoperative appearance and sensory recovery (Wu *et al.*, 2019). Moreover, free flaps require high microsurgical techniques, with a high risk of flap necrosis and complicated postoperative management. In this study, 80 patients had skin defects ranging from 4 to 12cm, and both kinds of local pedicled flaps could cover all the wounds. It shows that for most SCC of the heel, local pedicled flaps can meet the needs of reconstruction, and free flaps are not recommended for repair.

In terms of flap survival, clinical efficacy, and prognostic quality of life, the differences between the two groups were not statistically significant, suggesting that both kinds of flaps can effectively repair the defects after excision of heel SCC with high clinical application value, which is also in line with the previous research results (Tang *et al.*, 2022; Park *et al.*, 2023). RSFF is one of the commonly used methods to repair soft tissue injury in clinical practice. The sural nerve is a sensory nerve with nutrient arteries, which supplies blood to the surrounding tissues in addition to the nerve itself, and anastomoses with the *fibular* artery and the posterior tibial artery to form a nutrient vascular chain (Ciofu *et al.*, 2017). The repair of skin tissue in the foot and ankle should meet the characteristics of elasticity, toughness and wear resistance while ensuring sensitive sensory nerve function and dense subcutaneous tissue. RSFF is featured by constant vascular pedicles, few variations, sufficient blood supply, timely and sufficient venous reflux, great preservation of main arteries, reduced injury, and extensive wound suture (Johnson *et al.*, 2020). At the same time, this method allows the skin flap to be designed according to the characteristics of neurovascular architecture, without the need to change the posture during the operation (Schmidt *et al.*, 2020). However, the disadvantage of RSFF is also obvious, that is, poor sensory recovery; moreover, because it is a fascial flap, the pedicle must retain at least 2cm of the fascial tissue to ensure adequate blood supply to the flap,

resulting in the fact that the pedicle is usually bloated and relatively poor in appearance after rotation (Novriansyah *et al.*, 2021). This view is also confirmed by the fact that the RSFF group had a lower cosmetic satisfaction than the MPF group in this study.

Therefore, it remains an important research topic to find a skin flap with sufficient blood supply, beautiful appearance, flexible application, and moderate thickness, where MPF just fits the bill. After MPF repair, there is a thicker stratum corneum that is more similar in appearance to the sole of the foot and less prone to wear and tear, and the corresponding nerve branches are preserved, contributing to better postoperative sensory recovery (Liette *et al.*, 2020). We hypothesize that this is also the main reason why the MPF group had better sensory recovery than the RSFF group. However, MPF is unable to repair larger skin defects, affecting postoperative walking (Opoku-Agyeman *et al.*, 2020). On the contrary, the vascular distribution of RSFF is stable, the blood supply is reliable, the flap area that can be cut can be large, and the pedicle of the flap is located above the lateral ankle, which is more suitable for repairing lateral heel defects and can just make up for the limitation of the small repair area of MPF (Woo *et al.*, 2022).

However, for both MPF or RSFF, the following points need to be noted when used in the future: (1) The operation area should be thoroughly debrided, because a large amount of exudation and infection will cause poor survival of the flap base or even large-scale necrosis. (2) The flap should be 15 % larger than the wound surface, and a larger skin flap needs to be designed for obese patients due to the thick subcutaneous fat. (3) If the separation level is under the deep fascia, the edge should be fixed to prevent the deep fascia from separating from the flap, and attention should be paid to the protection of the perforating blood vessels to avoid damaging the deep vascular network of the deep fascia when using the electrotome. (4) When rotating the flap, attention should be paid to preventing the pedicle from twisting and pressing, and the dressing intensity should be appropriate. In addition, patients should be elevated after surgery and vasodilators such as alprostadiol or salvia miltiorrhiza be used to avoid poor blood flow in the flap

Due to the short follow-up time, we are unable to assess the long-term prognosis of the two groups for the time being. Besides, this is a single-center study with a small sample size, which may lead to the possibility of contingency in the results. Moreover, we should also comparatively analyze the application effects of MPF and RSFF with other flap repair methods, such as anterolateral thigh flaps and posterior tibial artery perforator flaps, so as to provide a more reliable and comprehensive reference for clinical practice.

## CONCLUSION

Both MPF and RSFF can meet the repair needs of most skin defects after heel SCC excision. Among them, MPF has the advantages of good appearance and sensation recovery and insusceptibility to long-term ulcers, but the repairable area is small, which is suitable for small and medial heel lesions. RSFF should be considered for repair if the lesion is located on the lateral side of the heel, or the defect range is too large. In future treatment of SCC, doctors should choose the appropriate skin flap transplantation method according to the degree of injury and the size of skin flap needed to ensure the patient's mobility and a more satisfactory appearance.

**GUAN, J. & LIANG, R.** Comparación anatómica del colgajo plantar medial *versus* el colgajo fasciocutáneo sural inverso en el tratamiento de defectos de la piel después de la excisión del carcinoma cutáneo de células escamosas. *Int. J. Morphol.*, 42(3):631-637, 2024.

**RESUMEN:** El objetivo del estudio fue comparar las ventajas y desventajas del colgajo fasciocutáneo sural inverso (RSFF) *versus* el colgajo plantar medial (MPF) en el tratamiento de defectos de la piel después de la escisión de un carcinoma de células escamosas (CCE) del talón. Los participantes de la investigación fueron 80 pacientes con CCE ingresados en el Hospital Popular de Lishui entre enero de 2019 y abril de 2022, que fueron asignados al grupo RSFF (n=37) y al grupo MPF (n=43) según el tipo de colgajo. Después de un año de seguimiento, se observó la supervivencia, la necrosis y ulceración del colgajo, así como la recuperación del dolor y la sensación táctil de ambos grupos. En el último seguimiento, se evaluó la respuesta clínica y se realizaron encuestas de salud de formato corto de 36 ítems (SF-36) y encuestas de satisfacción. Ningún paciente falleció en ninguno de los grupos y un paciente de cada grupo desarrolló necrosis del colgajo. El grupo MPF tuvo una mejor recuperación sensorial y una menor incidencia de ulceración del colgajo ( $P < 0,05$ ). No se identificaron diferencias notables entre grupos en la eficacia clínica y las puntuaciones del SF-36 ( $P > 0,05$ ). La satisfacción cosmética fue mayor en el grupo MPF que en el grupo RSFF ( $P < 0,05$ ). MPF contribuye a una mejor apariencia, mejor recuperación sensorial y un bajo riesgo de ulceración a largo plazo, mientras que RSFF es adecuado para lesiones con defectos grandes o localizados en la parte lateral del talón.

**PALABRAS CLAVE:** Colgajo plantar medial; Colgajo fasciocutáneo sural inverso; Carcinoma de células escamosas; Cirugía de escisión; Defectos de la piel.

## REFERENCES

- Bander, T. S.; Nehal, K. S. & Lee, E. H. Cutaneous squamous cell carcinoma: updates in staging and management. *Dermatol. Clin.*, 37(3):241-51, 2019.
- Chang, M. S.; Azin, M. & Demehri, S. Cutaneous squamous cell carcinoma: the frontier of cancer immunoprevention. *Annu. Rev. Pathol.*, 17:101-19, 2022.
- Ciofu, R. N.; Zamfirescu, D. G.; Popescu, S. A. & Lascar, I. Reverse sural flap for ankle and heel soft tissues reconstruction. *J. Med. Life*, 10(1):94-8, 2017.
- Claveau, J.; Archambault, J.; Ernst, D. S.; Giacomantonio, C.; Limacher, J. J.; Murray, C.; Parent, F. & Zloty, D. Multidisciplinary management of locally advanced and metastatic cutaneous squamous cell carcinoma. *Curr. Oncol.*, 27(4):e399-e407, 2020.
- Clivatti, G. M.; Do Nascimento, B. B.; Ribeiro, R. D. A.; Milcheski, D. A.; Ayres, A. M. & Gemperli, R. Reverse sural flap for lower limb reconstruction. *Acta. Ortop. Bras.*, 30(4):e248774, 2022.
- Corchado-Cobos, R.; García-Sancha, N.; González-Sarmiento, R.; Pérez-Losada, J. & Cañueto, J. Cutaneous squamous cell carcinoma: from biology to therapy. *Int. J. Mol. Sci.*, 21(8):2956, 2020.
- de Jong, E.; Lammerts, M. U. P. A.; Genders, R. E. & Bouwes Bavinck, J. N. Update of advanced cutaneous squamous cell carcinoma. *J. Eur. Acad. Dermatol. Venereol.*, 36 Suppl. 1(Suppl. 1):6-10, 2022.
- Firnhaber, J. M. Basal cell and cutaneous squamous cell carcinomas: diagnosis and treatment. *Am. Fam. Physician*, 102(6):339-46, 2020.
- Gutzmer, R.; Wiegand, S.; Kölbl, O.; Wermker, K.; Heppert, M. & Berking, C. Actinic keratosis and cutaneous squamous cell carcinoma. *Dtsch. Arztebl. Int.*, 116(37):616-26, 2019.
- Hedberg, M. L.; Berry, C. T.; Moshiri, A. S.; Xiang, Y.; Yeh, C. J.; Attilasoy, C.; Capell, B. C. & Seykora, J. T. Molecular mechanisms of cutaneous squamous cell carcinoma. *Int. J. Mol. Sci.*, 23(7):3478, 2022.
- Johnson, L.; Liette, M. D.; Green, C.; Rodriguez, P. & Masadeh, S. The reverse sural artery flap: a reliable and versatile flap for wound coverage of the distal lower extremity and hindfoot. *Clin. Podiatr. Med. Surg.*, 37(4):699-726, 2020.
- Knackstedt, T. J.; Knackstedt, R. W.; Djohan, M.; Djohan, R.; Gastman, B. R. & Crowe, D. R. New developments in the management of cutaneous squamous cell carcinoma. *Plast. Reconstr. Surg.*, 147(3):492-504, 2021.
- Langat, A. S.; Wan Sulaiman, W. A. & Mat Johar, S. F. N. Heel pad reconstruction with medial plantar flap. *Cureus*, 13(3):e13987, 2021.
- Le Guern, A.; Wiart, T.; Modiano, P. & Lebas, D. The keystone flap and its simplified version for malignant skin tumor defects of the lower limbs: A review of 25 cases. *Ann. Dermatol. Venereol.*, 148(4):241-5, 2021.
- Liette, M. D.; Ellabban, M. A.; Rodriguez, P.; Bibbo, C. & Masadeh, S. Medial plantar artery flap for wound coverage of the weight-bearing surface of the heel. *Clin. Podiatr. Med. Surg.*, 37(4):751-64, 2020.
- Lins, L. & Carvalho, F. M. SF-36 total score as a single measure of health-related quality of life: Scoping review. *SAGE Open Med.*, 4:2050312116671725, 2016.
- Novriansyah, R.; Prabowo, I. & Laras, S. Non-microsurgical bipedicle reverse sural fasciocutaneous flap with preservation of medial and lateral sural cutaneous nerve: Current surgical management of skin defect after traumatic Achilles tendon rupture - A case report. *Int. J. Surg. Case. Rep.*, 78:259-64, 2021.
- Opoku-Agyeman, J. L.; Allen, A. & Humenansky, K. The use of local medial plantar artery flap for heel reconstruction: a systematic review. *Cureus*, 12(8):e9880, 2020.
- Park, K. H.; Oh, C. W.; Kim, J. W.; Lee, H. J. & Kim, H. J. Reliability of reverse sural artery fasciocutaneous flap in older adult patients: Comparison study between older and younger patients. *Injury*, 54(8):110915, 2023.
- Schmidt, K.; Jakubietz, M.; Meffert, R.; Gilbert, F.; Jordan, M. & Jakubietz, R. The reverse sural artery flap - How do modifications boost its reliability? A systematic analysis of the literature. *JPRAS Open.*, 26:1-7, 2020.

- Simonacci, F.; Bertozzi, N.; Grieco, M. P.; Grignaffini, E. & Raposio, E. Surgical therapy of cutaneous squamous cell carcinoma: our experience. *Acta Biomed.*, 89(2):242-8, 2018.
- Tang, L.; Zhou, X. & Zou, Y. Combined great toe dorsal nail-skin flap and medial plantar flap for one-stage reconstruction of degloved finger. *Injury*, 53(7):2588-94, 2022.
- Villani, A.; Potestio, L.; Fabbrocini, G. & Scalvenzi, M. New emerging treatment options for advanced basal cell carcinoma and squamous cell carcinoma. *Adv. Ther.*, 39(3):1164-78, 2022.
- Waldman, A. & Schmults, C. Cutaneous squamous cell carcinoma. *Hematol. Oncol. Clin. North Am.*, 33(1):1-12, 2019.
- Winge, M. C. G.; Kellman, L. N.; Guo, K.; Tang, J. Y.; Swetter, S. M.; Aasi, S. Z.; Sarin, K. Y.; Chang, A. L. S. & Khavari, P. A. Advances in cutaneous squamous cell carcinoma. *Nat. Rev. Cancer*, 23(7):430-49, 2023.
- Woo, S. J.; Kang, J.; Hu, J. L.; Kwon, S. T.; Chang, H. & Kim, B. J. Medial plantar fasciocutaneous flap reconstruction for load-bearing foot defects in patients with acral melanoma. *Ann. Plast. Surg.*, 88(6):658-64, 2022.
- Wu, M.; Sun, M.; Dai, H.; Xu, J.; Wang, X.; Guo, R.; Wang, Y. & Xue, C. The application of keystone flap combined with vacuum-assisted closure in the repair of sacrococcygeal skin defect after tumor resection. *J. Surg. Oncol.*, 119(7):974-8, 2019.

Corresponding author:

Liang Renyi  
Department of Tumorotherapy and Chadiotherapy  
Lishui People's Hospital  
Lishui City People's Hospital  
No.1188, Liyang Street  
Liandu District  
Lishui City  
Zhejiang Province, 323000  
CHINA

E-mail:driang48@outlook.com