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游离股前外侧皮瓣修复对急诊肢体复合组织缺损患者近期和远期预后的影响 *

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摘要 目的:探讨与分析游离股前外侧皮瓣修复对急诊肢体复合组织缺损患者近期和远期预后的影响。**方法:**2015年4月到2021年9月选择在本院急诊的下肢复合组织缺损患者66例作为研究对象,根据1:1随机分配原则把患者分为研究组与对照组各33例。研究组给予游离股前外侧皮瓣修复治疗,对照组给予下肢外侧皮瓣修复治疗,观察与随访患者的近期和远期预后情况。**结果:**所有患者都顺利完成急诊修复治疗,所有皮瓣都创面都I期愈合,研究组的术后住院时间、术后换药次数、术后上皮组织完全覆盖创面时间、术后创面愈合时间少于对照组($P<0.05$)。研究组术后3个月的皮瓣血供优良率为100.0%,高于对照组的84.8%($P<0.05$)。研究组术后3个月的血肿、伤口感染、血管危象、骨髓炎等并发症发生率为3.0%,低于对照组的27.3%($P<0.05$)。研究组术后12个月的皮瓣保护性感觉率为100.0%,高于对照组的78.8%($P<0.05$)。**结论:**游离股前外侧皮瓣修复在急诊肢体复合组织缺损患者的应用能促进患者康复,提高皮瓣血供优良率,还可减少并发症的发生,改善患者远期的皮瓣保护性感觉状况。

关键词:游离股前外侧皮瓣;急诊;肢体复合组织缺损

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Effects of Free Anterolateral Thigh Flap Repair on the Short-term and Long-term Prognosis of Patients with Emergency Limb Composite Tissue Defect*

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ABSTRACT Objective: To investigate and analysis the effects of free anterolateral thigh flap repair on the short-term and long-term prognosis of patients with emergency limb composite tissue defect. **Methods:** From April 2015 to September 2021, 66 cases of patients with lower extremity composite tissue defects in the emergency department of our hospital were selected as the research subjects, and the patients were divided into the study group and the control group with 33 cases in each groups accorded to the 1:1 random allocation principle. The study group were given free anterolateral thigh flap repair, and the control group were given lower extremity lateral flap repair. The short-term and long-term prognosis of the patients were observed and followed up. **Results:** All patients successfully completed emergency repair treatment, and all flaps healed in stage I. The postoperative hospitalization time, postoperative dressing change times, postoperative epithelial tissue completely covering the wound and postoperative wound healing time of the study group were shorter than those of the control group ($P<0.05$). The excellent and good rates of flap blood supply in the study group at 3 months after operation were 100.0%, which were higher than that in the control group, which were 84.8% ($P<0.05$). The incidence rates of complications such as hematoma, wound infection, vascular crisis and osteomyelitis at 3 months after operation in the study group were 3.0%, which were lower than 27.3% in the control group ($P<0.05$). At 12 months after operation, the flap protective sensation rate in the study group were 100.0%, which were higher than that in the control group, which were 78.8% ($P<0.05$). **Conclusion:** The application of free anterolateral femoral flap repair in emergency patients with complex tissue defects of limbs can promote the recovery of patients, improve the blood supply rate of the flap, reduce the occurrence of complications, and improve the long-term protective sensory status of the flap.

Key words: Free anterolateral thigh flap; Emergency; Limb complex tissue defect

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前言

肢体复合组织缺损当前在临床上很常见,多发生于下肢,常伴有骨与肌腱外露。肢体复合组织缺损多由于局部高能量冲

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击造成,部分患者可出现关节外露、骨骼肌肉肌腱缺损创面等,具有很高的致残率,影响患者的康复与日常生活质量^[1,2]。同时随着医学技术的发展,当前整形医学对于整形修复需要达到生理性修复的标准^[3]。皮瓣带有自身血液供应,属于外科组织瓣的一种,包含皮肤组织的活的组织块^[4]。随着医学技术的发展,皮瓣移植已广泛应用于改善外形、修复创面和功能重建。但传统的以四肢非主干血管为蒂的局部皮瓣不能满足修复的需要,且因皮瓣面积和旋转弧度大,在临床上的应用受到限制^[5,6]。游离股前外侧皮瓣主要以旋股外侧动脉降支为血管蒂的大腿前外侧部穿支皮瓣,其供血动脉来自旋股外侧动脉系统的肌皮穿支或肌间隔穿支,在手、足外伤修复中具有美观性高、创伤小等优点^[7,8]。同时游离股前外侧皮瓣的供区隐蔽,皮瓣可切取面积大根据需要制成筋膜瓣、岛状瓣、肌皮瓣等^[9]。不过也有研究表明游离股前外侧皮瓣对于缺损位置较深的手外伤患者仍然不适用,且后期可能影响患者的肢体外观^[10,11]。本文具体探讨了游离

股前外侧皮瓣修复对急诊肢体复合组织缺损患者近期和远期预后的影响,以促进游离股前外侧皮瓣修复的应用。现报道如下。

1 资料与方法

1.1 研究对象

2015年4月到2021年9月选择在本院急诊的下肢复合组织缺损患者66例作为研究对象。

纳入标准:患者生命体征稳定;发病到治疗时间 ≤ 24 h;符合下肢复合组织缺损的诊断标准^[12];具有皮瓣修复治疗指征;患者知情同意并签署知情同意书;单侧肢体缺损;临床资料完整;医院伦理委员会批准了此次研究。

排除标准:妊娠与哺乳期妇女;不适合手术治疗的患者;肝肾肾功能不全;自动终止治疗者;合并肿瘤患者。

根据1:1随机分配原则把患者分为研究组与对照组各33例,两组患者一般资料对比无差异($P>0.05$)。见表1。

表1 两组一般资料对比

Table 1 Comparison of general data between the two groups

Groups	n	Cause of injury (car accident injury/smash injury/fall injury)	Gender (Male/female)	Age (years)	Body mass index (kg/m ²)	Time from onset to treatment (h)	Skin defect area (cm ²)
Research group	33	17/13/3	20/13	42.42 $\pm$ 1.72	22.18 $\pm$ 1.47	12.10 $\pm$ 2.34	25.68 $\pm$ 2.17
Matched group	33	16/14/3	22/11	42.76 $\pm$ 2.18	22.28 $\pm$ 1.17	12.88 $\pm$ 1.29	25.49 $\pm$ 1.72

1.2 修复方法

研究组:给予游离股前外侧皮瓣修复治疗,对创面进行清创,患者下肢给予静脉麻醉,选择平卧位,供侧臀部稍垫高。采用超声血流探测仪(KJ-2V2M,南京科进实业有限公司)测出旋股外侧动脉降支的皮肤穿出点,根据所需组织瓣的大小和形状及覆盖处需要的组织构成,设计切取组织的范围和类型。沿设计线上端作皮肤切口,深达阔筋膜下,游离血管蒂后在阔筋膜浅面解剖。在股直肌和股外侧肌肌间隙内寻找旋股外侧动脉的降支和(或)横支,作皮瓣内侧和下端切口,完全游离皮瓣,分离出血管蒂。待受区准备完毕后进行断蒂,解剖出阔筋膜瓣的穿支营养血管,供区进行直接缝合。

对照组:给予下肢外侧皮瓣修复治疗,对创面进行清创,根据皮肤缺损区域形状设计皮瓣,患者下肢给予静脉麻醉,选择平卧位,供侧臀部稍垫高。切开皮肤、皮下组织及深筋膜,显露外侧肌间隔内副动脉后支,结扎副动脉后支,结扎并切断桡侧副动脉前支,在副动脉后支深层掀起皮瓣并进行游离,离断足够长的血管蒂长度,将皮瓣与受区皮肤缝合,吻合血管,无张力与皮瓣神经缝合,供区直接皮内缝合。

两组术后定时观察瓣观察血循环情况,常规使用抗血管痉挛药、抗凝血药、改善微循环药物和抗菌药物。

1.3 观察指标

1.3.1 术后指标分析 记录两组的术后住院时间、术后换药次数、术后上皮组织完全覆盖创面时间、术后创面愈合时间等。

1.3.2 在术后3个月进行皮瓣血供优良率评价 优:皮瓣与正常皮肤较为接近,弹性好,不畏寒;良:皮瓣与正常皮肤较为接近,触之稍硬,弹性一般,不畏寒;差:皮瓣色泽暗淡,触之较硬,

无弹性,畏寒。优良率=(优+良)总例数 $\times 100.0\%$ 。

1.3.3 并发症记录 记录两组术后3个月出现的血肿、伤口感染、血管危象、骨髓炎等并发症发生情况。

1.3.4 皮瓣保护性感觉情况评定 术后随访1年,按英国医学研究会(British Medical Research council, BMRC)分级标准评定皮瓣保护性感觉情况。

1.3.5 满意率分析 在术后1年调查患者缺损修复后对供区恢复程度、皮瓣外形、手部功能等的满意情况,满意率=非常满意例数+比较满意例数/总例数 $\times 100.0\%$ 。

1.4 统计方法

本次研究统计软件为SPSS21.00软件,检验水准 $\alpha=0.05$ 。计量数据与计数数据分别采用均数 $\pm$ 标准差、百分比等表示,两两对比方法为t检验与卡方 χ^2 检验等。

2 结果

2.1 围手术指标对比

所有患者都顺利完成急诊修复治疗,所有皮瓣都创面都I期愈合,研究组的术后住院时间、术后换药次数、术后上皮组织完全覆盖创面时间、术后创面愈合时间少于对照组($P<0.05$)。见表2。

2.2 皮瓣血供优良率对比

研究组术后3个月的皮瓣血供优良率为100.0%,高于对照组的84.8%($P<0.05$)。见表3。

2.3 并发症发生情况对比

研究组术后3个月的血肿、伤口感染、血管危象、骨髓炎等并发症发生率为3.0%,低于对照组的27.3%($P<0.05$)。见表4。

表 2 两组术后指标对比(均数± 标准差)

Table 2 Comparison of postoperative indicators between the two groups (mean ± standard deviation)

Groups	n	The length of time (d)	Time for epithelial tissue to fully cover the wound (d)	Wound healing time (d)	Dressing change times (times)
Research group	33	9.18± 0.24 [#]	8.29± 0.33 [#]	21.44± 2.47 [#]	2.01± 0.32 [#]
Matched group	33	14.09± 1.47	13.48± 1.11	26.02± 2.11	4.58± 0.28

Note: Compared with control group, [#]*P*<0.05, the same below.

表 3 两组术后 3 个月的皮瓣血供优良率对比(n)

Table 3 Comparison of excellent and good rates of skin flap blood supply between the two groups 3 months after surgery (n)

Groups	n	Optimal	Well	Bad	Distinguished achiever ratio
Research group	33	30	3	0	33(100.0 %)
Matched group	33	23	5	5	28(84.8 %)

表 4 两组术后 3 个月的并发症发生情况对比(n)

Table 4 Comparison of postoperative complications between the two groups 3 months after operation (n)

Groups	n	Hematoncus	Wound infection	Vascular crisis	Osteomyelitis	Summation
Research group	33	1	0	0	0	1(3.0 %)
Matched group	33	3	2	2	2	9(27.3 %)

2.4 皮瓣保护性感觉情况对比

对照组的 78.8 %(*P*<0.05)。见表 5。

研究组术后 12 个月的皮瓣保护性感觉率为 100.0 %,高于

表 5 两组术后 12 个月的皮瓣保护性感觉情况对比(n)

Table 5 Comparison of protective sensation of skin flap between the two groups 12 months after surgery (n)

Groups	n	Restore protective sense	Ratio
Research group	33	33	100.0 %
Matched group	33	26	78.8 %

2.5 典型病例

患者刘某某,男性,19 岁,因乘坐电动车被卡车带倒拖行数米,致左小腿下段不全离断并大面积皮肤软组织缺损,右膝关节开放性骨折,右大腿下段皮肤撕脱伤,急诊在全身麻醉下行清创,左胫骨骨折复位外固定支架固定,移植对侧大隐静脉

桥接吻合左侧胫前动脉重建足部血供,游离移植同侧股前外侧肌皮瓣修复,游离皮瓣尺寸 280 mm× 180 mm;右膝关节清创、骨折复位内固定术,术后保肢成功,创面一期愈合,骨折顺利愈合。如图 1。



图 1 游离股前外侧皮瓣修复对急诊肢体复合组织缺损患者近期和远期预后

Fig. 1 Short-term and long-term prognosis of patients with emergency limb complex tissue defects with free anterolateral femoral flap repair

3 讨论

急诊肢体复合组织缺损患者在临床上很常见,缺损情况比较严重,通常不能以皮片移植法修复,采用以局部皮瓣修复也极难满足治疗需求。另外肢体的精细活动功能需要有良好的感觉功能的恢复,为此对于修复的要求比较高^[13]。

随着医学技术的发展,游离皮瓣的临床应用越来越广泛。邻近皮瓣多伴有回缩性,术后易发生创面坏死、瘢痕挛缩。很多患者在修复后易出现皮瓣麻木无感觉,皮瓣臃肿后期需多次修整,也影响修复后的美观性^[14,15]。游离股前外侧皮瓣不牺牲主干血管,具有皮肤质地好、厚薄适中、吻合皮神经后皮瓣感觉恢复良好,也能提供足够面积,易于解剖与吻合,成活率高^[16]。游离股前外侧皮瓣能作血管桥接,既能给皮瓣供血,又能恢复手部远端血供,对供区的功能和外形影响小,患者容易接受^[17]。本研究显示:所有患者都顺利完成急诊修复治疗,所有皮瓣都创面都Ⅰ期愈合,研究组的术后住院时间、术后换药次数、术后上皮组织完全覆盖创面时间、术后创面愈合时间少于对照组;研究组术后3个月的皮瓣血供优良率为100.0%,高于对照组的84.8%,表明游离股前外侧皮瓣修复在急诊肢体复合组织缺损患者的应用能促进患者康复,提高皮瓣血供优良率。该结果与Harris TGW^[18]等人的报道具有相似性。分析可知,游离股前外侧皮瓣含有丰富的血管网,血管网中有无数侧支与邻近皮下血管网沟通,与神经外膜动脉具有相互吻合作用^[19]。并且游离股前外侧皮瓣重建了缺损部位的静、动脉供血通道,可以携带神经、肌腱等复合组织等,从而缩短康复时间^[20]。并且游离股前外侧皮瓣具有皮肤较薄、易于切取、弹性好,术后皮瓣生长较为自然,可避免患者因为多次手术和长期姿势固定所带来的痛苦^[21]。

本研究显示:研究组术后3个月的水肿、伤口感染、血管危象、骨髓炎等并发症发生率为3.0%,低于对照组的27.3%,表明游离股前外侧皮瓣修复在急诊肢体复合组织缺损患者的应用能减少并发症的发生。该结果与Eiteaz FA^[22]等人的报道具有相似性。分析可知,当前对于肢体复合组织缺损的修复不仅要强调受区的修复效果好,同时也要强调受区的破坏少。游离皮瓣移植治疗修复创面,对关节活动尽可能减小,达到减轻对供区的破坏的目的^[23]。游离股前外侧皮瓣,具有血供可靠、血管蒂恒定、切取简便、选择灵活性大等优点,可明显纠正皮瓣修复后的局部臃肿。不过股前外侧区域的皮神经是由股外侧皮神经的大的内侧支支配,在穿支中容易被破坏,行股前外侧皮瓣移植的患者长期随访中发现供区大腿的力量稍有减弱^[24,25]。同时股外侧动脉解剖变异较多,受其他血管肌皮支的干扰,为此在术中需要仔细辨认血管的隶属关系^[26]。并且在进行肌皮穿支型血管的分离操作时,要小心分层剥离,在分离时发现肌肉中有着一一些细小的分支血管,要进行电凝止血,术中应注意避免损伤,可有效降低并发症的发生^[27]。

本研究显示:研究组术后12个月的皮瓣保护性感觉率为100.0%,高于对照组的78.8%,表明游离股前外侧皮瓣修复在急诊肢体复合组织缺损患者的应用能促进恢复患者的感觉功能。该结果与Wang M^[28]等人的报道具有相似性。分析可知,游离股前外侧皮瓣在术区和创面缘的皮神经吻合,利于后期皮瓣区域的感觉恢复,发挥神经作用。并且游离股前外侧皮瓣修复

患者的预后基本只有线状色素残留,其与肢体的桡动脉匹配较好,可作血管桥接,从而使得皮瓣得到良好供血。股前外侧区的皮下脂肪峰尖,不易下垂,能方便地携带阔筋膜,深面的筋膜易于固定,两个分开的皮肤穿支蒂时可形成双叶皮瓣,因此修复效果更佳^[29,30]。不过本研究由于人力资源的限制,样本数量较小,对于游离股前外侧皮瓣移植的作用机制分析还不够深入,将在后续研究中探讨。

总之,游离股前外侧皮瓣修复在急诊肢体复合组织缺损患者的应用能促进患者康复,提高皮瓣血供优良率,还可减少并发症的发生,改善患者长期的皮瓣保护性感觉状况。

参考文献(References)

- [1] Sharma S, Das N, Gupta V, et al. Lower Extremity Marjolin's Ulcer Reconstruction With Free Anterolateral Thigh Flap: A Case Series of 11 Patients[J]. *Cureus*, 2020, 12(11): e11392
- [2] Tiengo C, Sonda R, Monticelli A, et al. Achilles Tendon Region Defects: Delayed Composite Anterolateral Thigh Flap With Stripping of Fascia Lata: A Case Series[J]. *J Oncol*, 2020, 66(12): 13-22
- [3] Yang Z, Xu C, Zhu Y, et al. Flow-Through Free Anterolateral Thigh Flap in Reconstruction of Severe Limb Injury [J]. *Ann Plast Surg*, 2020, 84(5S Suppl 3): 165-170
- [4] Bali Z U, zkan B, Keçeci Y, et al. Reconstruction of burn contractures with free anterolateral thigh flap in various anatomic sites [J]. *Ulus Travma Acil Cerrahi Derg*, 2021, 27(3): 337-343
- [5] Chew K Y, Kok Y O, Ong W L, et al. Coverage of anterior mediastinal tracheostomy with bipedicle anterolateral thigh flap [J]. *Medicine (Baltimore)*, 2021, 28(4): 4-9
- [6] Gholami M, Shaban B, Hejazi A, et al. Anatomical Variations of Anterolateral Thigh Flap: A Fresh Cadaver Dissection Study[J]. *World J Plast Surg*, 2021, 10(3): 18-24
- [7] Huang Q, Huang K, Xue J. Vacuum sealing drainage combined with free anterolateral femoral skin flap grafting in 16 cases of pediatric soft tissue damage to the foot and ankle [J]. *Transl Pediatr*, 2021, 10(10): 2489-2495
- [8] Kim S H, Lee W J, Chang J H, et al. Anterior skull base reconstruction using an anterolateral thigh free flap [J]. *Orthop Surg*, 2021, 22(5): 232-238
- [9] Li R G, Zeng C J, Yuan S, et al. Reconstruction of Large Area of Deep Wound in the Foot and Ankle with Chimeric Anterolateral Thigh Perforator Flap[J]. *Orthop Surg*, 2021, 13(5): 1609-1617
- [10] Liu X, Huo D, Wu G. Deep Inferior Epigastric Flap Combined Bilateral-Anterolateral Thigh Flap for the Coverage of Both Lower Extremity Soft-Tissue Defect: A Case Report and a Literature Review[J]. *Clin Cosmet Investig Dermatol*, 2021, 14(11): 153-161
- [11] Moreno A, Cabrera L F, Pedraza M, et al. Anterolateral thigh versus radial forearm flap for cervical esophageal reconstruction in cancer patients: A retrospective cohort study in Colombia [J]. *Cir Cir*, 2021, 89(4): 461-468
- [12] Koshima I. Combined Tissue Transfer for Extensive Lower Limb Complex Defects: Flow-through Flaps, Chimera, and "Orochi" Flaps. *J Reconstr Microsurg*, 2021, 37(1): 17-21
- [13] Orra S, Malphrus E, Hannan C, et al. Anterolateral Thigh Flap for Reconstruction of an Oropharyngectomy Defect [J]. *Plast Reconstr Surg Glob Open*, 2021, 9(9): e3794

- [14] Pang X, Wu P, Zhang X, et al. Clinical application of polyfoliate anterolateral thigh perforator flap with single-perforator [J]. Zhong Nan Da Xue Xue Bao Yi Xue Ban, 2021, 46(9): 983-988
- [15] Pflibsen L R, Teven C M, Lundberg J N, et al. Composite Anterolateral Thigh and Fascia Lata Free Flap for Abdominal and Groin Reconstruction in a Pediatric Patient[J]. Plast Reconstr Surg Glob Open, 2021, 9(10): e3837
- [16] Bekeny J C, Zolper E G, Fan K L, et al. Composite Cutaneous Anterolateral Thigh Flap with Rolled Fascia Lata for Tibialis Anterior Tendon Reconstruction [J]. Plast Reconstr Surg Glob Open, 2020, 8(7): e2959
- [17] Kang Y, Wu Y, Ma Y, et al. "Primary free-flap tibial open fracture reconstruction with the Masquelet technique" and internal fixation[J]. Injury, 2020, 51(12): 2970-2974
- [18] Harris TGW, Manyevitch R, Wu WJ, et al. Pedicled Anterolateral Thigh and Radial Forearm Free Flap Phalloplasty for Penile Reconstruction in Patients With Bladder Exstrophy[J]. J Urol, 2021, 205(3): 880-887
- [19] Wong A, Sbitany H. Reconstruction of Intrapelvic Defects Using the Free Anterolateral Thigh Flap: Expanding the Traditional Algorithm [J]. Ann Plast Surg, 2020, 84(5): 554-558
- [20] Yang Z, Xu C, Zhu Y, et al. Flow-Through Free Anterolateral Thigh Flap in Reconstruction of Severe Limb Injury [J]. Ann Plast Surg, 2020, 84(5S Suppl 3): S165-S170
- [21] DI Summa PG, Watfa W, Campisi C, et al. Free Versus Pedicled Anterolateral Thigh Flap for Abdominal Wall Reconstruction [J]. Anti-cancer Res, 2019, 39(12): 6759-6768
- [22] Eitezaz FA, Rashid M, Yousaf S, et al. Can The Anterolateral Thigh Flap Replace The Rectus Abdominis Free Flap In The Reconstruction Of Complex Maxillary Defects? [J]. J Ayub Med Coll Abbottabad, 2018, 30(1): 74-77
- [23] Sun S L, Zhong B, Zhou S Z, et al. Comparison between anterolateral thigh free flap and jejunal flap for tissue reconstruction in patients underwent resection of pharyngoesophageal squamous cell carcinoma after radiotherapy failure: a retrospective study [J]. BMC Surg, 2021, 21(1): 389
- [24] Tsai H Y, Lee Y C. Simplifying the Combined Use of Fibula Flap and Anterolateral Thigh Flap for Oromandibular Reconstruction [J]. Plast Reconstr Surg Glob Open, 2021, 9(11): e3938
- [25] Accorona R, Fazio E. Single-Skin Paddle Anterolateral Thigh Free Flap with Iliotibial Tract for Internal Lining in Reconstruction of Full-Thickness Cheek Defect [J]. J Orthop Surg Res, 2020, 19(1): 157-158
- [26] Al-Shami E, Ren G H, Xiang D Y, et al. A neglected problem in the utilization of free anterolateral thigh flap toward reconstructing complicated wounds of extremities: the obliteration of deep dead space[J]. Surg Case Rep, 2020, 15(1): 483
- [27] Yi L, Jimeno Z K L T, Sasidaran R A, et al. A challenge in soft tissue reconstruction: The use of pedicled anterolateral thigh fasciocutaneous flap and gluteal fasciocutaneous rotational flap in reconstructing a huge full thickness lateral trunk defect [J]. Ann Med Surg (Lond), 2021, 71(14): 102933
- [28] Wang M, Gu Y, Chen F, Li J, Wang J, Yin Y. Anterolateral thigh and groin conjoined flap for emergent repair of ultra-long complex tissue defects in forearm and hand[J]. Chine J Rep Reconst Sur, 2018, 27(8): 1010-1014
- [29] Yu D, An L, Feng Y, et al. The application of a modified anterolateral thigh-flap-based perforator to reconstruct a large and complicated defect of the vulva[J]. Asian J Surg, 2021, 44(3): 568-571
- [30] Matsumine H, Fujimaki H, Takagi M, et al. Reconstruction of Lower Limb Necrotizing Fasciitis by Hydrosurgical Debridement and Multiperforator Anterolateral Thigh Flap [J]. Plast Reconstr Surg Glob Open, 2020, 8(9): 3150-3155