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УСПЕШНОЕ НАЛОЖЕНИЕ ПАХОВОГО ЛОСКУТА НА ДЕФЕКТ ТЫЛЬНОЙ СТОРОНЫ КИСТИ У ПАЦИЕНТА ПОЖИЛОГО ВОЗРАСТА С СОПУТСТВУЮЩЕЙ ПАТОЛОГИЕЙ

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Лоскут из паховой области на ножке является эффективным и легко адаптируемым методом для закрытия ран на кисти и дистальном отделе предплечья. Этот метод обеспечивает надежные результаты и является менее сложным и трудоемким, чем свободная пересадка тканей. Несмотря на распространенное мнение о том, что пожилым пациентам следует избегать лечения методом пахового лоскута из-за риска тугоподвижности в плечевом суставе, мы получили успешные результаты лечения 93-летней женщины с сахарным диабетом 2 типа, артериальной гипертензией, ревматоидным артритом и двусторонними операциями на тазобедренном суставе в 2009 и 2007 годах. Немедленная мобилизация плеча и продолжительная физическая терапия на этапах созревания лоскута и отделения ножки были решающими факторами в достижении этих благоприятных результатов. Данный клинический случай произошел в отделении реконструктивно-пластической хирургии и хирургии кисти Университетской Клиники Магдебурга в Германии.

Ключевые слова: *паховый лоскут, травма тыльной стороны кисти, мигрирующий лоскут*

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SUCCESSFUL GROIN FLAP FOR DORSAL HAND DEFECT IN ELDERLY PATIENT WITH COMORBIDITY

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The pedicled groin flap is an effective and adaptable method for covering wounds on the hand and distal forearm. This approach offers reliable results and is less complex and time-consuming than free-tissue transfer. Despite the common belief that the groin flap should be avoided in elderly patients due to the risk of shoulder stiffness, we found successful outcomes in a 93-year-old woman with type 2 diabetes mellitus, arterial hypertension, rheumatoid arthritis, and a history of bilateral hip TEP surgeries in 2009 and 2007. Immediate shoulder mobilization and ongoing physical therapy during the flap maturation and pedicle division phases were crucial in achieving these favorable results. This case report was performed in Department of plastic, reconstruction and Hand surgery, University hospital Magdeburg, Germany.

Keywords: *Groin Flap, Dorsal Hand Injury, Pedicled flaps*

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Fig. 1. Debridement of dorsal hand and the amputation of the middle finger

Fig. 2. Skin and soft tissue wound defect (approximately 9×8 cm) with exposed extensor tendons

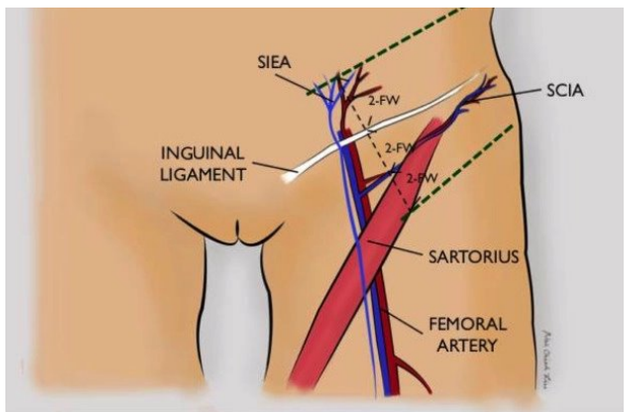

Fig. 3. Anatomy of superficial circumflex iliac artery (SCIA) and the Sartorius landmark (4)

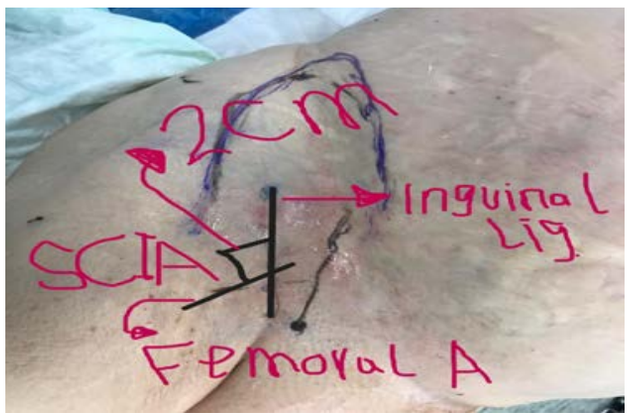

Fig. 4. Landmarks of the flap

Introduction. Repairing defects after severe hand trauma with extensive soft tissue loss demands immediate and skilled intervention. Despite the increasing variety and accessibility of free flaps, the groin flap introduced by McGregor and Jackson in 1972 remains in use [1]. While the groin flap was extensively discussed in publications during the 1980s, recent literature on the subject is limited. The groin flap's advantages include its rapid and straightforward harvest, and for obese patients, the groin provides a notably thinner donor site compared to the flaps of other body areas [2–6].

Additionally, using the groin flap helps prevent further compromise of circulation in an already injured hand, which can be a risk with free flaps due to potential vascular injury during end-to-side anastomoses. Free flaps also necessitate high surgical expertise, which may not be available in all settings, and they require a longer initial surgery time [7, 8].

Case Presentation. A 93-year-old woman was referred by her family doctor and admitted to another institution on January 31, 2023, due to increasing pain and significant swelling in her right hand. Examination revealed no trauma or open injuries. An abscess was identified and drained, with debridement and excision of the extensor tendon sheath performed on the day of admission. Over time, necrosis developed in the middle finger and dorsal hand, necessitating further debridement, amputation of the middle

Fig. 5. Landmarks of the flap

finger, and application of Vacuum-assisted closure (VAC) to the dorsal hand (*fig. 1*). The patient had a medical history of Type 2 Diabetes Mellitus, arterial hypertension, rheumatoid arthritis, and previous bilateral hip TEP surgeries in 2009 and 2007. Due to the severity of her wound, she was transferred to our institution for further treatment.

On February 28th, 2023, the patient was presented to our hospital with skin and soft tissue wound defect measuring approximately 9×8 cm on the back of right hand with exposed extensor tendons (*fig. 2*). After taking Microbiological smear, the patient underwent debridement and irrigation of the wound down to the vital

Fig. 6. Raising of the flap

Fig. 7. Stop of dissection at the medial edge of the Sartorius muscle

Fig. 8. Coverage of the defect by the flap

Fig. 9. Postoperative monitoring

tissue with removal of diseased tissue on the skin and subcutaneous with applying VAC system. Microbiological smear revealed Staphylococcus epidermidis and the patient received antibiotics.

On March 3rd, 2023, signs of inflammation and infection were resolved, so we were able to cover the defect with groin flap. The arterial inflow to the groin flap is provided by the superficial circumflex iliac artery (SCIA) (*fig. 3*), a branch off the external iliac/superficial femoral artery at the level of the inguinal ligament (*fig. 4*). The SCIA pierces the fascia at the medial aspect of the Sartorius muscle, making the Sartorius a key landmark in identifying the pedicle during dissection. The Sartorius muscle, inguinal ligament, and iliac crest were all identified and marked to determine flap design. A pencil Doppler was used to determine the location of the arterial pedicle (*fig. 5*), usually approximately a finger breadth below the inguinal ligament. The maximum width of the design was determined by pinching the skin to assess the potential tension of the closure after flap harvest. The Sartorius muscle was a key landmark in dissection.

Surgical procedure. The patient, under general anesthesia, was positioned in the dorsal decubitus position with a block under the ipsilateral buttock to provide better access to the donor site. Key anatomical landmarks such as the anterior superior iliac spine, pubic bone, inguinal ligament, and femoral artery were identified. The flap boundaries were defined using a «2 fingers width» rule, which corresponds to the transverse diameter of the patient's index and middle fingers at the distal interphalangeal joint. This rule helps locate the origin of the superficial circumflex iliac artery from the femoral artery, positioned 2 fingers width below the inguinal

Fig. 10. Clamping of the flap

Fig. 11. Division on day 21

Fig.12. The final result of the flap

ligament. The upper limit of the flap is set 2 fingers width above the inguinal ligament, aligned with the superficial circumflex iliac artery's path to the anterior superior iliac spine, serving as the flap's axis. The lower limit is 2 fingers width below where the artery emerges, parallel to the axis. The lateral limit is determined by the size of the defect at the recipient site.

The size of the flap needed was estimated by comparing it to the tissue loss, which was carefully assessed after debridement. The emergence of the superficial iliac circumflex artery was identified by palpating the common femoral artery, and the flap was raised from lateral to medial, including all subcutaneous tissue while remaining supra-fascial (*fig. 6*). Near the Sartorius muscle, the fascia was included in the flap to prevent damage to the arteriovenous bundle [9]. Dissection stopped at the medial edge of the Sartorius muscle, but the skin could be further incised for additional elasticity if needed. At the medial aspect of the Sartorius, the fascial plane around the pedicle was incised, and the artery and vein were freed to their origin (*fig. 7*). The lateral cutaneous nerve of the thigh was protected at the lateral edge of the Sartorius. The flap measured 12 cm by 8 cm. The donor site was then closed with drain suction.

At this stage, tubing is done, ideally extending it sufficiently to allow the hand to be lifted off the abdominal plane for range of motion exercises. The hand is then positioned in the inguinal region, and the flap is fitted to the defect, starting with the corner fixation point (*fig. 8*). The posterior edge, which is more challenging to suture, is addressed first, followed by the anterior edge. Beveling the fat at the skin edge prior to securing the flap helps to reduce tension at the suture line and lowers the risk of necrosis at the edges.

Tulle gras dressings are applied to all sutures and changed every three days. To avoid any stretching on the flap pedicle during patient movement, a supportive device is used to maintain the upper limb. The hip on the side of the inguinal flap is kept in flexion by placing the lower limb on a separate splint [10].

Postoperative follow-up. For the first 48 hours, the flap was monitored every 6 hours for any indications of ischemia or fibrosis (*fig. 9*). While the flap remained attached and the patient was hospitalized, the rehabilitation program included supervised sessions twice daily. The patient tolerated both the surgery and postoperative immobilization well, starting passive and active-assisted range-of-motion (ROM) exercises for the fingers on the first postoperative day once pain levels decreased, taking care to avoid twisting the pedicle.

After 2 weeks, pedicle compression was performed by clamping the flap for 3 minutes on the first day, 5 minutes on the second day, and 10 minutes on the third day. This process continued until the end of the third week to check for any signs of ischemia or necrosis (*fig. 10*). The flap displayed no signs of ischemia or necrosis and maintained good perfusion with effective venous outflow. Once it was established that pedicle compression did not impair flap perfusion, the flap was divided at the end of the third week (day 21) (*fig. 11*) [9].

The patient began ambulation exercises on the seventh day after surgery and was transferred to a rehabilitation center on the 24th day, following the division of the tube and the final placement of the flap. Post-discharge, she attended outpatient therapy sessions three times a week and continued a home exercise program similar to the hospital routine.

Thorough preoperative planning is essential to prevent raising a flap that is either too large or too small and to ensure the tubing is the appropriate length, avoiding issues such as twisting at the base or ischemia from being too short.

Results. The postoperative period was smooth, and the surgical reconstruction resulted in excellent functional and aesthetic outcomes, despite the patient's existing conditions of diabetes mellitus, hypertension, and rheumatoid arthritis (*fig. 12*).

Discussion. Since its introduction in 1972 [1], the pedicled groin flap has become a widely used method for addressing soft-tissue defects in the hand and forearm. The technique is appreciated for its speed, simplicity, reliability, and low morbidity. It is especially beneficial for patients with arterial injuries or atherosclerosis because it eliminates the need for arterial anastomoses and minimizes the risk of flap steal in compromised distal circulation. However, older patients, who are more prone to atherosclerosis, face higher risks of shoulder and elbow stiffness and systemic complications post-procedure. Therefore, it is advised to avoid using pedicled groin flaps in individuals over the age of 50 [11].

This case report was conducted at the Department of Plastic, Reconstruction, and Hand Surgery at University Hospital Magdeburg, Germany. We successfully utilized pedicled groin flaps in a 93-year-old female patient with diabetes mellitus, hypertension, and rheumatoid arthritis, who had undergone bilateral hip TEP surgeries in 2009 and 2007. She required coverage for severe skin and soft-tissue defects on the dorsum of her hand due to a severe soft tissue infection. The groin flap, renowned for its reliability as both a pedicled and free flap for soft-tissue coverage of the hand and forearm, was harvested swiftly and ensured a reliable blood supply.

The patient's successful functional recovery indicates that the use of pedicled groin flaps does not inherently increase the risk of stiffness in elderly patients if certain precautions are observed. First, utilizing the maximal length of the groin flap allows for the creation of a longer tubed segment, providing more length for mobilizing the hand and arm while ensuring meticulous care to avoid twisting of the segment. Second, early mobilization of the hand and arm through physical and occupational therapy helps reduce joint stiffness and edema in both the injured hand and the flap. Lastly, continued aggressive therapy after the division of the flap is essential to restore maximal motion in the upper extremity [12].

In our patient, these strategies yielded excellent results in covering soft-tissue defects and restoring upper extremity function without any systemic complications from the flap procedure.

Although Arner and Moller concluded that elderly patients (over 50 years) have a higher risk of systemic complications from pedicled groin flap procedures, they did not adjust for preexisting medical conditions in their series [13]. Reports suggest that free flaps have a higher risk of systemic complications in elderly patients compared to younger ones. However, this increased risk can be mitigated by addressing preexisting medical conditions. Shorter, less stressful surgeries for patients with such conditions reduce anesthesia requirements and eliminate the risk of needing additional surgery for vascular anastomosis revision if flap failure occurs [14].

Thus, we believe that age alone should not determine the choice of procedure for soft-tissue coverage in elderly patients, nor should it exclude the use of a groin flap. The pedicled groin flap, with its shorter anesthetic requirement, may be preferable to a free-tissue transfer for elderly patients with multiple medical issues, despite the need for at least one additional, short procedure for pedicle division and final insertion.

The groin flap must be considered in light of its limitations, the most significant being postoperative shoulder stiffness in elderly patients [15]. However, early physiotherapy has been shown to prevent this stiffness. The position of the upper limb during the necessary time before division is uncomfortable [10, 16, 17]. Keeping the hand bandaged to the trunk for three weeks complicates postoperative care and can cause temporary hand edema, which usually resolves quickly due to the effective venous and lymphatic drainage in the groin area. Another drawback is the need for multiple stages, including division followed by thinning procedures, which are often necessary for patients with a significant amount of adipose tissue. Additionally, there is a sensory loss associated with this flap, which can be particularly troublesome when affecting the thumb or other fingers [12]. However, Goertz et al. concluded in their study on the efficacy of pedicled groin flaps for hand defect treatment that the overall results were favorable, with most patients expressing satisfaction [18].

Conclusion. We believe that the pedicled groin flap can be used safely and effectively in elderly patients without compromising functionality or significantly increasing the risk of systemic complications. This success hinges on precise positioning of the flap and tubed pedicle, as well as comprehensive therapy during both the flap maturation process and after the pedicle has been divided.

Конфликт интересов

Авторы заявили об отсутствии конфликта интересов.

Conflict of interest

The authors declare no conflict of interest.

Соответствие нормам этики

Авторы подтверждают, что соблюдены права людей, принимавших участие в исследовании, включая получение информированного согласия в тех случаях, когда оно необходимо, и правила обращения с животными в случаях их использования в работе. Подробная информация содержится в Правилах для авторов.

Compliance with ethical principles

The authors confirm that they respect the rights of the people participated in the study, including obtaining informed consent when it is

necessary, and the rules of treatment of animals when they are used in the study. Author Guidelines contains the detailed information.

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