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Interest of the McGregor flap in covering loss of substance in the forearm: About a case and review of the literature

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Abstract

The McGregor flap is a remotely pedicled “axial” inguinal flap. This is a very reliable flap for coverage of major upper limb substance loss, even if its major drawback is that it requires two operations. It remains a flap of choice in the therapeutic arsenal of hand and forearm surgery, in emergency or scheduled surgery. Tissue loss has always been a challenge for reconstructive surgeons. We report a case of loss of substance of the posterior surface of the forearm following a road traffic accident, treated with a McGregor flap with good results.

Keywords: McGregor flap, reconstructive surgery

Introduction

McGregor, in 1972 ^[1], proposed this flap, drawing inspiration from the vascularization of the deltopectoral flap, centered on its own arteriovenous pedicle, by looking for a skin flap in a sampling zone dependent on a constant, anatomically reliable vascular system and can be transferred easily, while leaving an acceptable aesthetic damage. The zone, corresponding to the superficial iliac circumflex artery, seemed to him the ideal harvesting site, allowing a large inguinal flap to be lifted, with the advantage of being able to carry out a tubulization which allows mobilization of the hand. Tissue loss has always been a challenge for reconstructive surgeons. The aim of this study is to present the interest of this type of flap in the loss of tissue substance of the forearm so that it can be integrated into the practice of young surgeons.

Patient and observation

Observation

A 17-year-old subject with no particular history consulted the emergency department of Skyborne Hospital in Bukavu for trauma to the right forearm following a road traffic accident (ATR) which had occurred five days earlier. He had been admitted to a health center where he had received 3000 IU serum therapy subcutaneously, a dressing associated with antibiotics, the nature and dose of which he does not know. Given the state of the wound, his family decided to bring him to us for treatment. On admission, he is febrile at 38.9°C and there is a soiled dressing taking the upper 2/3 of the left arm, on removal of which there is a large blunt wound dotted with deep necrotic skin tissue on the the postero-lateral face extending on the lateral face of the arm by abrasions in the process of healing. (Fig 1)

A blood test had revealed hyperleukocytosis at 12,000 GB with neutrophilic predominance, A CRP at 26 and bacteriology done on the pus taken from the wound had isolated *Staphylococcus aureus* susceptible to cefotaxime. A treatment had been instituted consisting of a daily dressing with Dakin, cefotaxime 3x 1 gr/d//7days IVD, Paracetamol Co of 500mgr, 2x2co/d//5d PO The evolution had been marked on D7 by the disappearance clinical and biological signs of infection and placement of a McGregor flap had been indicated and scheduled on D12 with the patient's consent.

The flap was successfully placed according to the procedure described above and the postoperative follow-up was simple. The patient was discharged from the hospital on D38, 5 days after the second operation consisting of weaning the flap 21 days after the first operation. It was reviewed at the control at one month and at two months and the aesthetic result was satisfactory.



Fig 1: State of the wound on admission.

Discussion

Anatomical bases: The superficial iliac circumflex artery is a constant branch (fig. 3) of the lateral aspect of the femoral artery (isolated or from a common trunk with the inferior epigastric artery). It starts 2.5 to 3.5 cm below the inguinal ligament and is about 1 mm in diameter. It has an ascending, infrafascial course at the level of the sartorius muscle, dividing into two branches at its middle third: a deep branch, remaining suprafascial, which will surround the anterosuperior iliac spine, and a superficial infrafascial branch, passing under the antero-superior iliac spine to divide into a subdermal vessels. It is this branch that vascularizes the flap [2]. The venous pedicle is composed of a satellite network of arteries, which drains into the femoral vein, and an independent superficial network flowing into the great saphenous vein. The dimensions of the flap can reach 30-35 cm long by 15 cm wide. In large flaps, the vascularization of the most lateral portion is ensured by the anastomoses of the subcutaneous vascular networks. It is safe to sample up to the lateral part of the abdominal wall. For McGregor [1], the maximum length should not exceed two-thirds of the distance separating the emergence of the superficial circumflex iliac artery and the sacroiliac joint.



Fig 3: Outline of the flap along the course of the superficial iliac circumflex artery

Surgical technique

Sampling technique

Preoperative assessment It is necessary to look for the existence of operative scars in the sampling area. Appendectomy scars are not contraindications. This flap should be avoided in case of anterior hernia repair.

Installation: The patient is installed in the supine position, with a block under the ipsilateral buttock, which allows the iliac crest to be fully exposed.

Preparation: The first stage of surgery consists of trimming and repairing, or even just identifying the various damaged structures at the level of the loss of substance to be covered. Then comes the measurement of the dimensions of the necessary flap. The choice of the harvesting side is guided by the location of the loss of substance and the comfort given by the position of the recipient limb. The ipsilateral side is generally chosen, but this is not a rule. (figs. 1, 2)



Fig 2: Preparation of the flap recipient site: debridement of the lesion.

Flap outline: This is the most important preparatory step. It is essential to trace the skin incisions taking into account the anatomical landmarks: – Identification of the inguinal ligament, joining with a line the spine of the pubis to the antero-superior iliac spine; – then identification of the emergence of the superficial iliac circumflex artery, about 2.5 cm below the inguinal ligament, by palpation of the femoral artery (roughly two fingerbreadths); – the axis of the flap is drawn, corresponding to the line joining the point of emergence of the artery at the antero-superior iliac spine; – the design of the flap can then be centered around this line, depending on the size needed to cover the loss of substance. The drawn flap takes the form of a racket, presenting at its origin, on either side of the emergence of the artery, a width of 2.5 cm (two fingerbreadths). It is widening towards the lateral part. Schematically, the length of the pedicle to be tubed corresponds to the distance separating the emergence of the artery from the flap and the antero-superior iliac spine; the dimensions of the actual flap, intended to cover the skin defect, are calculated from the antero-superior iliac spine [3, 4].

Flap lifting: Sampling begins at the distal or lateral part, removing all the subcutaneous tissue, while remaining suprafascial. At the upper edge of the sample, the dissection is continued as far as the inguinal ligament; on the other hand, at the lower edge, it is necessary to locate the lateral edge of the sartorius muscle. When you reach its lateral edge, you have to remove the fascia covering the muscle so as not to damage the arteriovenous bundle. It is not necessary to continue the dissection until the emergence of the artery. We stop at the medial edge of the sartorius muscle, but it is possible to incise the skin further to have greater elasticity. During dissection, care should be taken with the lateral cutaneous nerve of the thigh, which passes between the tensor fascia latae and the sartorius. This nerve normally passes away from the sample, but it may be subject to anatomical variations.

Donor site closure: It is always possible and must be performed before fixing the flap wall on the recipient site. Do not hesitate to peel off the teguments from the abdominal wall, sometimes up to the umbilicus. Skin elasticity, in the upper segment, is important; on the other hand, under the iliac crest, it is almost nil. We can help by bending the hips (cushion under the knees during the first hours). Drainage is useful in large flaps, due to the significant undermining.

Tubulization of the pedicle: For the comfort of the patient and nursing care, it is preferable to have a closed tube, but this is difficult to achieve in the event of a large fatty panniculus and it is not essential. In any case, it is necessary to check that the tubulization does not compromise the vascularization of the flap and, in case of doubt, release stitches.

Adaptation of the flap to the loss of substance (fig.3): Always start by fixing the distal part of the flap. On the contrary, if the flap is tubed at its base, it is better to start at the corner point. The position of the limb must be studied for the best comfort of the patient, allowing the best mobility. The pedicle portion can be located either on the radial or ulnar edge of the hand, the important thing is that we can mobilize the fingers and the wrist in pronation-supination.



Fig 3: Adaptation of the flap to the loss of substance after tubulization of the pedicle.



Fig 4: Image of the state of the flap on the day of the first dressing.

The McGregor flap is a choice flap in the therapeutic arsenal of forearm surgery, in scheduled surgery. The inguinal flap has a place of choice in the great loss of substance of the upper limb, the hand, the wrist, the forearm (as was the case for our observation), up to the elbow [1]. It keeps multiple advantages and is reliable, easily and quickly sampled; which makes it a solution of choice in the coverage of losses of cutaneous substances at the level of the hand, the forearm [5, 6] but, its execution requires the knowledge of anatomy and the mastery of the technique in rigorous asepsis because infection, as in any surgery, is the real enemy. For Baron [7], infection of the surgical site is all the more frequent when the flap is used in an emergency and suggests that tubulization of the flap at its base makes it possible to reduce maceration phenomena and therefore infection. We had reassured ourselves of the control of the infection of the recipient site before placing our flap and had opted for the tubulization of the flap in order to reduce the risk of infection. Necrosis is another complication of this flap, but rare and often on the distal part, not exceeding 14% of cases. It would be linked to poor posture of the flap by plication of the pedicle [8]. Compared to other locoregional flaps, the McGregor flap does not leave unsightly scars at the donor site and it makes it possible to obtain a large self-closing flap [9]. For reasons of tissue remodeling, we recommend looking for the existence of surgical scars in the sampling area. However, appendectomy scars are not contraindications but this flap should be avoided in case of previous hernia repair. Degreasing at the level of the distal zone of the flap in case of excessive thickness can be envisaged, but in our practice, we recommend caution so as not to damage the arterial system.

Several authors [6, 7, 9, 10] have reported their experience with this flap and were, like us (fig 8.), satisfied with the aesthetic and functional results. The dressing should not be an opportunity to infect the wound. Covered with a fatty dressing, as well as the sutured areas, the dressing should allow monitoring of the coloration of the flap, leaving a wide window. The restraint of

the upper limb must be effective, to deal with the awakening to a possible phase of agitation. It is desirable to immobilize the shoulder and the elbow with a Dujarrier type bandage in the first hours. On the other hand, it should not compress the flap. The restraint can be limited if the anesthetist performs a plexus block, which has the double advantage of limiting the mobility of the limb on awakening and, above all, that of providing an analgesic block during the first postoperative hours. The postoperative follow-up is generally simple, and from the first postoperative day, the shoulder and the elbow can be freed, the patient is authorized to lengthen the legs. In our experience, getting up was possible from the second day, as well as walking. Other teams only allow chairside seating. Local care, apart from the first dressings, is done in the shower, with the patient sitting or standing depending on his general condition. The mobilization of the hand can be started from the first days, it is all the easier as the pedicle is longer. Discharge is authorized from the sixth day, after organizing care with the home care team [1]. In our context, we prefer to keep the patient in hospital until weaning to allow us hospital monitoring and reduce the risk of infection.

Revascularization is done through the recipient site within three weeks [1]. We recommend weaning at this time because we believe there is no risk of ischemia. Some authors [4, 11] shorten the time to 15 days with pedicle clamping tests. Weaning is performed by sectioning the pedicle and closing the donor site, then adapting the flap section area to the edge of the loss of skin substance.

This flap has several advantages

- Flap dimensions, larger than regional forearm flaps.
- As it is a remote flap, it does not sacrifice a major vascular axis like the Chinese flap, the radial artery may be necessary during later reconstruction times.
- Great technical ease in the realization, as well as reproducibility.
- Excellent reliability.
- Inconspicuous aesthetic sequelae at the sampling site (scar concealed in the swimsuit) [1].
- But there are some drawbacks to be aware of:
- Need for several operating times: weaning, then degreasing(s), often mandatory in patients with a large adipose panniculus.
- Difficulty of postoperative care with a risk of infection, given the abdomino-pelvic location, easily avoided by careful and regular dressings (shower +++).
- Difficulty of rehabilitation. In addition, the sloping position of the hand does not effectively combat postoperative edema.
- Difficulty in recovering autonomy in elderly patients, with stiffness rapid, recovery of mobility of the shoulder and walking which remains difficult.

Conclusion

The McGregor flap seems to us very well indicated in the loss of substance of the forearm. With a reliable vascularization that can allow the lifting of a large flap, of glabrous skin, without muscle sacrifice in a single surgical installation, it allows direct closure of the donor site. It has advantages both functionally and aesthetically. We recommend the enhancement of its place in the recovery of loss of substance of the upper limbs.

Conflicts of interest

The authors declare no conflict of interest

Author contributions

All authors have contributed substantially to the completion of this work.

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