The Distally Pedicled Peroneus Brevis Muscle Flap for Treatment of an Arthrocutaneous Fistula after Ankle Arthroscopy: Case Report

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Abstract
A 48-year-old female presented with an arthrocutaneous fistula after ankle arthroscopy right. This complication was initially treated conservatively without success. Seven weeks after the primary procedure, the fistula was covered with the use of distally pedicled peroneus brevis muscle flap. The further course was uncomplicated.

ABBREVIATIONS
DPBBMF: Distally Pedicled Peroneus Brevis Muscle Flap; VAC: Vacuum Assisted Closure

INTRODUCTION
Ankle arthroscopy is a reliable surgical procedure for diagnosing and treating of posttraumatic, degenerative, inflammatory, congenital, or neoplastic disorders, and provides good to excellent results in up to 90% of cases [1,2]. However, this minimally invasive technique is not free of any complications. Persistent drainage through the portals is one of these complications in ankle [3], and it has mostly described after knee arthroscopy [4]. Early postoperative wound healing complications can potentially lead to a chronic arthrocutaneous fistula (i.e. synovial fistula) with or without joint infection.

The distally pedicled peroneus brevis muscle flap (DPBBMF) has proven to be useful for coverage of soft tissue defects around the ankle (i.e. critical distal third of lower leg) with exposure of tendons, bone, and/or osteosynthesis plates. We present one case of a postoperative arthrocutaneous fistula after ankle arthroscopy that was successfully treated with debridements, negative-pressure Vacuum Assisted Closure (VAC) therapies, and packing of the persistent fistula with the use of a DPBBMF.

CASE PRESENTATION
A 48-year-old female presented with a posttraumatic arthritis of the ankle right after an ankle sprain six months ago. There were no radiographic pathologies. The ankle arthroscopy combined with arthroscopic synovialectomy through an anterolateral portal was performed. The intra operatively placed drain was removed one day after surgery, and the patient was conservatively treated by the family doctor in the further course.

Four weeks after ankle arthroscopy, the patient returned to our hospital with an persistent arthrocutaneous fistula through the anterolateral portal with size of two cm in diameter (Figure 1a). Assessment by culture revealed an intra articular bacterial load with staphylococcus aureus. The infectious fistula was treated by debridements, joint lavages, VAC therapies, and additional systemic antibiotic drug therapy. After five surgical procedures within three weeks, the infection was consolidated, assessed by culture, but a closure of cavity could not be reached.

Seven weeks after ankle arthroscopy, the persistent fistula was closed with the use of a DPBBMF. The pivot point of the dissected peroneus brevis muscle was six cm proximal from the tip lateral malleolus, and both peroneal nerves were carefully dissected and preserved (Figure 1b). For transposition of the muscle into the cavity, the adjacent skin bridge was not incised (Figure 1c), and both muscle portions were temporary covered by a synthetic polyurethane two-layer skin substitute Epigard® (Figure 1d). Four days after surgery, the muscle showed sufficient blood circulation without venous congestion, and both muscle portions were definitively covered with split-thickness skin grafts. The wound healing was uncomplicated (Figure 1e).

DISCUSSION
The overall complication rate in ankle arthroscopy is reported to be 3.5 to 10.3% [5]. Persistent drainage through the portals after arthroscopy of ankle or other joints remains unpredictable...
and it can be a challenging therapeutic problem. It was found in 0.9 to 3.9% of cases after ankle arthroscopy, and with a portion in up to 32.3% of all complications [3, 6]. Generally, this kind of complication is to be considered as a major prerequisite for development of postoperative joint infection. Patients with early non-infected wound complications after primary or revision total knee arthroplasty may have a risk of subsequent infection up to 20% [7, 8], whereas in patients who have no postoperative wound complications the infection rate is normally below 2% [9]. DeLee et al. [10], reviewed retrospectively 118,590 knee arthroscopies and found that 30% of cases with synovial fistulae could not be treated conservatively with success. Recurrence of synovial fistula of the knee after arthroscopy, initially treated with antibiotics and immobilization, is a concern and can lead to prolonged morbidity [11].

Local muscle flaps are recommended for repair of chronic fistulae of internal organs or knee joint penetrating into the surrounding soft tissue and skin [12-15]. However, when using muscle flaps for coverage of leg, all surgeons need a learning curve. In 1983, Neale et al. [16] reported on major and minor complications in 32% of a total of 95 muscle flaps and they agreed that the causes were mainly technical errors, inadequate debridement, use of diseased and traumatized muscle, and unrealistic objectives. Quality of debridement is the key to success for healing of wounds. VAC therapy before soft tissue coverage provides a sterile and controlled environment that can lessen the duration of wound healing, promotes better capillary circulation, and decreases the bacterial load [17].

Originally, the peroneus brevis was a type II muscle flap according to the classification by Mathes and Nahai [18] with a dominant pedicle from the peroneal artery which is located proximally, and distal minor pedicles from the peroneal and/or posterior tibial vessels; but it was reclassified as a type IV with segmented pedicles only which may limit mobility [19]. When harvesting the muscle with the proximal segmented pedicles, it can be used as a flap for coverage of the middle third of lower leg. When harvesting the distal segmented pedicles of the peroneal artery which are mainly found within six cm from the tip of lateral malleolus (approximately three fingerbreadths) [19], it can be used in a distally pedicled manner for coverage of the critical distal third of lower leg. As the average length of muscle is 25 cm, as much as 19 cm of muscle can be mobilized to cover defects that are distal to the fibular tip, however, dissection should stop when the muscle is sufficient for coverage in order to preserve as many distal pedicles as possible [20].

The DPPBMF is an economical, reliable and relatively easy procedure. The advantages are that this technique does not require microsurgical expertise, the donor site can always be closed primarily, and the flap is relatively reliable with it constant anatomy even in high-risk patients with a number of comorbidities; but care must be taken when using this flap in patients with peripheral arterial disease [21]. Fansa et al. [22], reported on a flap survival in 100% of 12 patients, four patients had minor wound healing complications of the skin grafts without needing of additional surgery. Lorenzetti et al. [23] reported on a flap survival in 100% of 10 patients, and the ankle functionality and stability were maintained due to preservation of peroneus longus muscle. On the other hand, Ovaska et al. [24] reported on required subsequent surgical interventions because of flap-related complications in up to 39% when using the DPPBMF for reconstruction of soft tissue following deep infection after internal fixation of ankle fractures. In a review of literature, including 192 patients who underwent coverage with a DPPBMF, the averaged complication rate is reported to be 41.6% [25]. Regardless of surgeon’s experience in detection and harvesting of DPPBMF [16], venous congestion and oedema formation are the most important factors for development of flap-related complications. One comparative study has shown that the use of VAC therapy for seven days after coverage statistically significant reduces partial flap loss and skin graft necrosis, whereas no differences could be
found in both groups (N=43 vs. N=31) regarding complete flap loss [26]. The use of Epigard® before skin grafting provides a sterile and controlled environment and promotes better capillary circulation [27].

REFERENCES


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