

# McCraw and Arnold's Atlas of Muscle and Musculocutaneous Flaps



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Global-HELP  
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# BICEPS FEMORIS

## ANATOMICAL CONSIDERATIONS

### *Surface Markings*

The biceps femoris is the most lateral of the "hamstring" muscles as it courses from the ischial tuberosity to the lateral aspect of the knee. The lateral border of the muscle can be palpated at the margin of the vastus lateralis muscle and the lateral intermuscular septum. The medial border of the muscle forms a visible boundary of the popliteal fossa.

### *Origin and Insertion*

The long head of the biceps femoris muscle originates from the ischial tuberosity along with the semitendinosus and semimembranosus muscles. The short head has a deeper origin from the linea aspera of the femur and the lateral supracondylar line of the femur. Distally the muscle passes over the lateral head of the gastrocnemius muscle and inserts into the head of the fibula and the lateral condyle of the tibia. The biceps femoris tendon directly overlies the fibular collateral ligament of the knee joint.

### *Adjacent Muscles*

The biceps femoris muscle is fused with the more medial semitendinosus and semimembranosus muscles through their combined origin from the ischial tuberosity. In the mid thigh these two hamstring muscle groups are separated by the sciatic nerve. In the lower thigh the semitendinosus muscle diverges away from the biceps femoris muscle as the two muscles separate to form the upper borders of the popliteal fossa. Laterally, the biceps femoris muscle is densely fused to the lateral intermuscular septum and the vastus lateralis muscle. The intimate relationship of the biceps femoris muscle to the sciatic and the common peroneal nerves should be recognized. The sciatic nerve passes beneath the biceps femoris muscular origin and then bisects the two hamstring muscle groups in the midline of the thigh. The common peroneal nerve passes beneath the biceps femoris tendon in its course to the fibular head.

The functional importance of the biceps femoris muscle is still debated. The biceps femoris tendon does tighten the flexed iliotibial tract, which is an important lateral knee stabilizer. The contributions of the lateral collateral ligaments and the iliotibial tract are probably more important than the biceps femoris tendon in lateral knee stability, but the biceps femoris is a major external rotator of the knee. As an isolated muscle, it is expendable as a knee flexor except in certain athletic situations. In an anecdotal number of cases, we have en-

countered lateral knee instability with the use of the tensor fascia lata flap but not with the biceps femoris flap.

### *Vascular Pattern*

The biceps femoris is a classic example of a muscle which is supplied almost totally by multiple segmental vessels. These deep perforating vessels arise from the profunda femoris vessels in the upper two-thirds of the muscle while the lower one-third of the muscle is supplied by the popliteal vessels. Because of the lack of intramuscular vascular connections, each deep muscular perforator supplies only an isolated segment of the biceps femoris muscle. For this reason the muscle is usually employed as an advancement flap so the majority of the perforating vessels can be left intact. Since the distal perforating vessels are relatively dominant, only a distally based "island" flap of any size is feasible. A proximal muscle flap can be used to obliterate an ischial cavity, but the vascularity of the proximal muscle flap is variable.

### *Motor Nerve*

Sciatic nerve.

### *Sensory Nerve*

Posterior cutaneous nerve of the thigh.

## USES

The biceps femoris V-Y myocutaneous flap is used primarily for ischial pressure sores. It is the flap of choice for the isolated ischial ulcer so that the gluteus maximus myocutaneous flap can be preserved for later sacral coverage problems. Bilateral myocutaneous advancement flaps can also provide a remarkable amount of soft tissue for central perineal defects. The segmental vasculature of the biceps femoris muscle limits the applicability of "island" muscle flaps. Although a turnover muscle flap in combination with a laterally based skin flap is a reasonable option for ischial ulcers, it is less reliable than the V-Y myocutaneous advancement flap. The distally based biceps femoris muscle flap is occasionally considered for popliteal and suprapatellar defects when the gastrocnemius muscle is unavailable.

## REGIONAL FLAP COMPARISONS

The biceps femoris V-Y advancement flap has several advantages over other local flaps in the paraplegic pa-

tient. Although the vastus lateralis muscle flap and the gluteus maximus musculocutaneous flap are just as useful for ischial defects, their dissection is more tedious, and they are preferably reserved for later hip and sacral problems. For poorly understood reasons, the biceps femoris V-Y flap is more reliable in the paraplegic patient than either the TFL or the gracilis myocutaneous flap. Neither of the latter flaps is useful to obliterate the usual ten by ten centimeters ischiectomy cavity.

## DISADVANTAGES

The V-Y advancement myocutaneous flap has a limited (ten centimeters) upward mobility, which can present a problem in a very large ischial or buttock defect. This mobility can be improved by elevating the entire posterior calf musculature and also by dividing the sciatic nerve in the paraplegic patient. It is necessary to use bilateral V-Y flaps for large central perineal defects; however, both of the donor sites can be primarily closed. Although distally based and proximally based biceps femoris muscle flaps can be designed, their reliability is always in question and their vascular axis and arc of rotation cannot be determined until the time of exploration.

## ADVANTAGES

The advantages of the biceps femoris V-Y myocutaneous advancement flap derive from its demonstrated simplicity and reliability. The distally based muscle flap offers a distinctly secondary muscle flap source for suprapatellar or popliteal defects because the gastrocnemius muscle flap is more easily dissected and is obviously more reliable. The functional loss of the biceps femoris muscle as a lateral knee stabilizer and knee flexor is not noticeable if the adjacent muscles are undisturbed.

## COMPLICATIONS, PITFALLS, AND DONOR SITE

The complications associated with the V-Y advancement flap are seldom related to flap necrosis unless there is an excessive sacrifice of the segmental vessels. This should rarely be encountered since it is not usually necessary to divide any of these deep perforators in the V-Y flap advancement. Wound disruptions have occurred following ischiectomy and a biceps femoris myocutaneous flap closure because the functional ischial skin deficit is always much larger than the surface ischial ulcer. It is tempting to obliterate an ischial cavity with a biceps femoris muscle flap and to close the skin directly. However, a deficiency of expansile skin over the ischium contributes to an exceedingly high incidence of wound disruption with a direct closure. It is better to prevent an ischial wound disruption by replacing the lost ischial skin completely and avoiding any hip flexion for a period of two weeks. The flotation bed is routinely used to dissipate the harmful effects of direct pressure on the flap in the supine position. Although the flotation bed will dissipate this direct pressure paraplegic patients, and quadriplegic patients in particular, are frustrated by their inability to turn in this bed. This has resulted in a sensation of claustrophobia which is manifested by extreme agitation. The V-Y biceps femoris myocutaneous flap donor site has not yielded any significant complications in our experience.



**1**

Outline of the biceps femoris V-Y advancement flap on the posterior thigh in the cadaver. The long head of the biceps femoris muscle is outlined in its course between the ischium and the knee. The upper margin of the flap lies at the level of the ischial tuberosity.

**2**

Elevation of the biceps femoris long and short heads with the overlying skin. The muscle has been separated from its fascial attachments to the vastus lateralis and the semitendinosus muscles on either side.



3

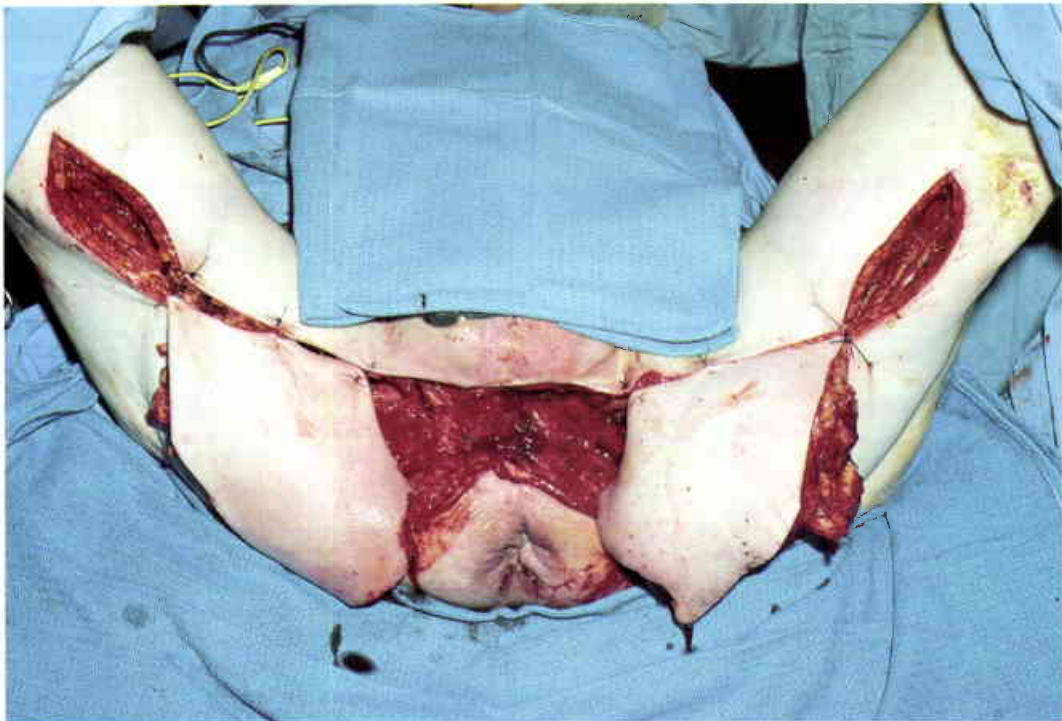
Once the biceps femoris tendon is divided, the myocutaneous flap unit can be advanced to cover the ischium. The donor site is closed in a V-Y fashion.





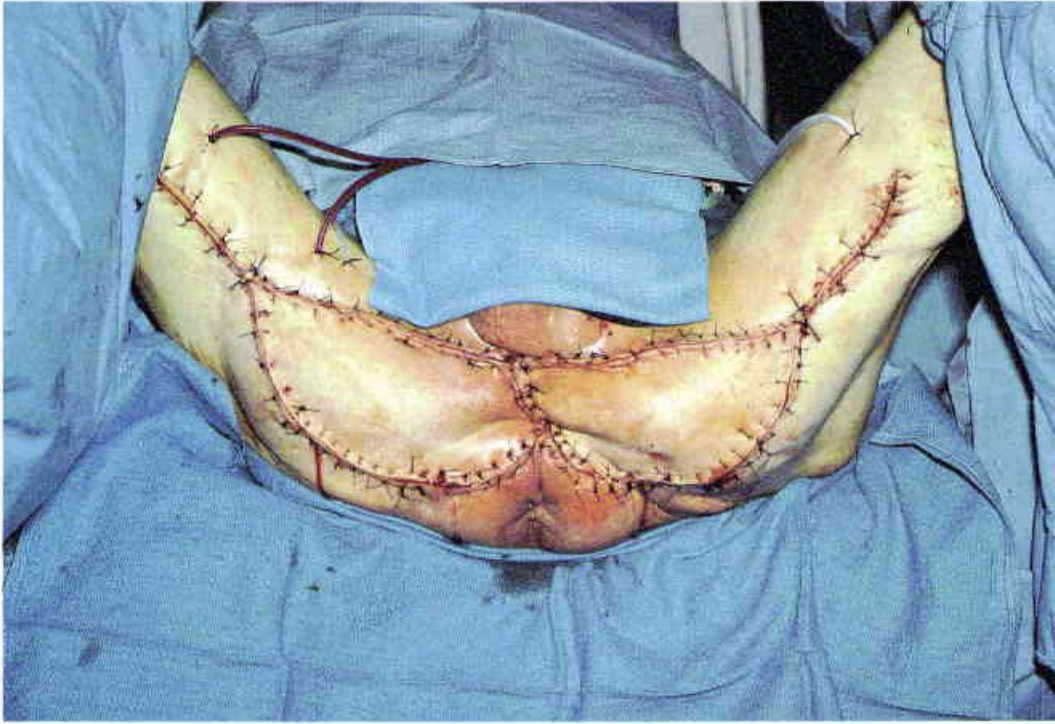
4

Massive perineal pressure sore in a sixty-year-old paraplegic with multiple sclerosis. The problem was complicated by erosion of the perineal urethra, which necessitated ligation of the bladder neck and permanent suprapubic drainage. (Case of P.G. Arnold)



5

The perineal wound has been widely debrided. Bilateral biceps femoris myocutaneous flaps are ready to be advanced into the central perineum in a V-Y fashion.



6

Note the amount of V-Y advancement into the central perineum.



7

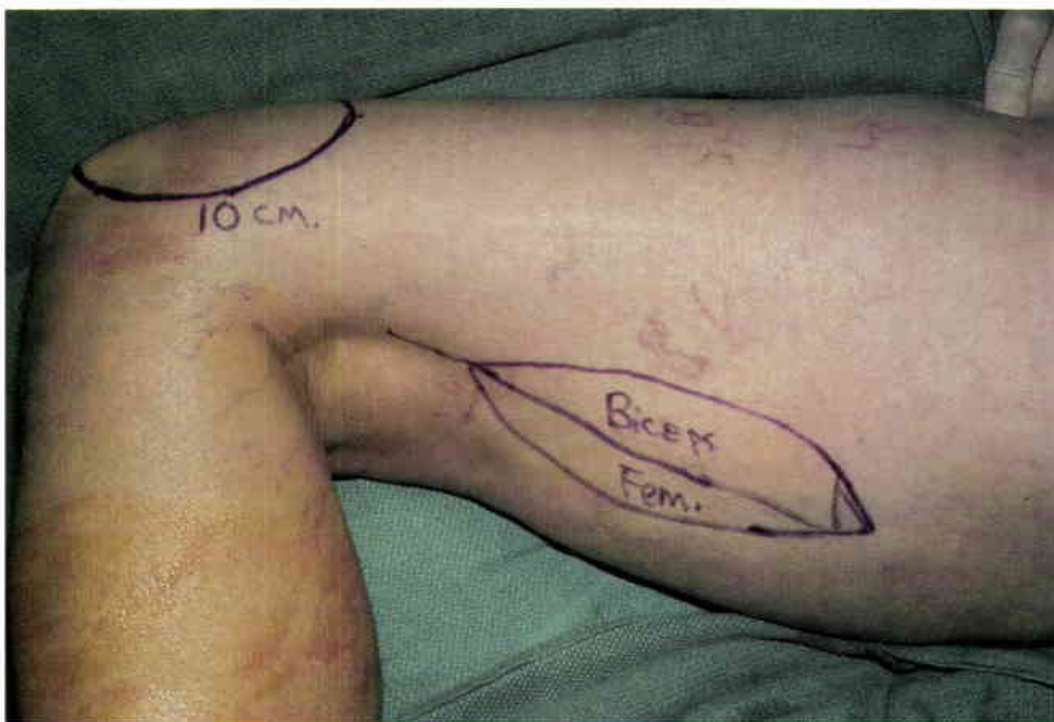
Completed healing six weeks following perineal reconstruction. The patient returned to full time desk work following this procedure.





8

Forty-eight-year-old female with a biopsied level II melanoma of the suprapatellar area. The proposed tumor excision is outlined. (Case of J.B. McCraw)



9

The long head of the biceps femoris is outlined as a “reversed” muscle flap.



10

The segmental perforators of the biceps femoris muscle are demonstrated with blue backing just lateral to the sciatic nerve. The two proximal perforators shown here will be divided.



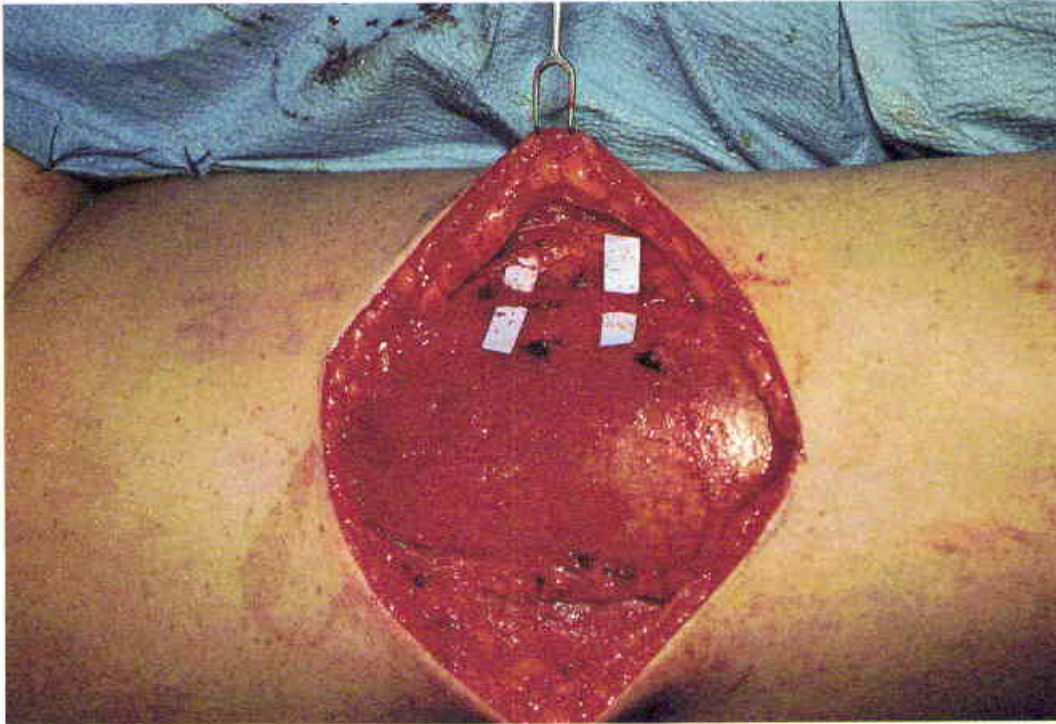
11

The "reversed" biceps femoris muscle was rotated into the suprapatellar defect to provide a pliable cover for the patellar tendon.

**12**

Skin-grafted muscle flap four years following surgery. The patient returned to full activity. There was no functional disability from the use of the biceps femoris muscle.





13

Twelve centimeter excision of a level II melanoma of the posterior thigh in an eighteen-year-old female. The posterior cutaneous nerve of the thigh has been preserved. (Case of J.B. McCraw)



14

A primary closure was desirable for esthetic reasons. Note the transverse tension of the approximated posterior thigh skin.



15

The temporary 2-0 silk sutures demonstrate the tension of the closure. The silk sutures were removed, and fasciocutaneous advancement flaps were used to give a nearly tension-free closure. To accomplish this, the fascia lata was incised medially, laterally, and distally. This allowed the skin and the fascia to advance into the defect.



16

View of the scar at two years. The closure was dramatically facilitated by incising the fascia lata medially and laterally. This type of closure is simpler and faster than a "simple" skin graft.

## BICEPS FEMORIS

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