Problems After Knee Arthroplasty: "Things That Go Bump in the Night"

Extensor Mechanism Problems: What To Do, What To Do!

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The ability to extend the lower limb is a crucial aspect of a successful arthroplasty, not only to enable ambulation and stair climbing but also to preserve the stability of the prosthesis. Although loss of that critical function occurs in <1% of knees, its restitution remains one of the greater challenges in knee surgery.

Even the most concise discussion of extensor reconstruction must begin with several principles. First, extensor problems are largely vascular in origin, and further surgeries often serve only to decrease the blood supply to these critical tissues. Second, the forces across a knee approximate seven to eight times body weight and thus, simple reconstructive techniques often are ineffective. Third, most technical attempts at direct tissue approximation, even in a fresh rupture, are unsuccessful because of the preceding two issues. Finally, in the author’s experience, 50% of extensor mechanism disruptions occur in a technically poor arthroplasty—either stiff or unstable—which requires simultaneous revision with the repair of the extensor. After the prosthetic knee is correct, several technical points are essential in dealing with the soft tissues.

DEALING WITH THE SOFT TISSUES

First, every molecule of host tissue must be saved, because attempts to excise calcific deposits or patellar fragments can only further devascularize the anterior structures. Second, redundant anterior scar tissue should not be excised but rather enfolded in the final suture repair. Third, a helpful way to satisfy both of these issues is to tubularize the patulous anterior soft tissues with a running vertical mattress suture. This creates a cable of extensor tissue that mimics the natural extensor and enhances trochlear tracking. Fourth, redundant adjacent tissue can be “borrowed” from the proximal quadriceps mechanism and turned down to close transverse defects. Fifth, opportunity to advance the vastus medialis obliquus over the repair should never be forsaken. This serves to improve extensor tracking and also to bring more vascularized tissue into the anterior aspect of the knee. Finally, all of the soft-tissue repairs need to be protected from the extreme force on the anterior knee, and it is the author’s preference to use non-absorbable Mersilene tape rather than pins and wires, which will fragment and require subsequent excision.

TECHNIQUE

Autografting techniques are available for supplementing or substituting for extensor dysfunctions. The most popular has been described by Cadambi and Engh and involves the use of the semi-tendinosus tendon. This requires an extensive dis-
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The author prefers the iliobibial band, which can be harvested from the lateral side of the knee using a tendon stripper. A long and thick strip of tissue can be obtained, woven above the patella, and secured to the medial tibia (Figure 1).

The ultimate and definitive technique for extensor reconstruction is the extensor allograft. First described by Emerson in 1990, this involves the use of a tibial bone-patellar tendon-patella-quadriceps tendon graft of substantial size and length. The graft usually needs to be specially ordered for at least 8 cm of quadriceps tendon length. Irradiation of grafts is variable, and higher doses are known to compromise graft strength while enhancing sterility. Patellar resurfacing of the graft is inappropriate, as the construct is insensate.

The approach for graft application should involve a midline incision, with judicious excision of residual patellar and heterotopic bone fragments. All available soft tissue should be preserved to facilitate the closure.

After determining the appropriate patellar height relative to the prosthetic joint line, a dovetailed slot is cut into the host tibia, slightly to the medial side to ensure proper tracking. The graft is trimmed and prepared to accommodate this slot and can at that point be impacted and finish-cut at the distal end (Figure 2). Multiple wires are preferable to screws for fixation because of the fragility of the graft bone and the interference with tibial stems (Figure 3).

The proximal end of the allograft is most important. The author’s preference is to use a nonabsorbable stay suture running from the quadriceps tendon on the medial side through the proximal allograft in a Krakow stitch and then proximally once more up the lateral side through the vastus lateralis tendon. With the limb in full extension, this stay suture can be held at full tension while individual sutures are used to close the residual host tissue over the tendon (Figure 4). The importance of tightening the tendon in full extension cannot be underestimated, as other authors have been unsuccessful with this general technique when that was not observed.

Postoperatively, the patient is placed in a cast or brace in full extension for 6 weeks with no attempt at quadriceps strengthening. Thereafter, a brace allows progressive 30° ranges of motion at 2-week intervals. The priority at this point is ingrowth and graft incorporation, and attempts at muscle strengthening are likely to produce failure.

Success rates in the 90% range have been reported, although almost every series reports a mild to moderate extensor lag even in the most successful cases. Nonetheless, the ability to regain limb extension and to stabilize the prosthetic arthroplasty makes this technique highly rewarding.

REFERENCES