

## How I do it

# Surgical exposure of the stiff knee

Robert Barrack

Tulane University School of Medicine, Department of Orthopaedic Surgery, 1430 Tulane Avenue, SL32, New Orleans, LA 70112, USA. Tel +1 504 584-3514. Fax -3517

Performing knee arthroplasty in the presence of limited motion presents a challenge. Ankylosis is commoner in inflammatory arthritis, particularly in patients who are wheelchair-bound, or who have had their knee immobilized (Figure 1). Revision arthroplasty in the stiff knee is also a challenge. Generally, the knee must be flexed well beyond 90 degrees, the tibia subluxated anteriorly, and the patella everted or displaced laterally to perform primary or revision arthroplasty successfully. If the passive arc of motion is less than 60°, it is unlikely that a standard operative approach will achieve adequate exposure without excessive

tension on the patellar tendon and risk of avulsion. The two extensile exposures most frequently used in this situation are the patellar turndown and the tibial tubercle osteotomy (TTO).

The TTO, as popularized by Whiteside (Whiteside 1995, Whiteside and Ohl 1990), has unique advantages in cases of severe patella baja or when a well-fixed stem and cement are present in a revision case. In cases of patella baja, the osteotomy can be reattached more proximally, partially correcting the baja. When a well-fixed stem must be removed, the cement and stem can be accessed through the extended osteotomy. While infre-



Figure 1. Preoperative radiograph of ankylosed knee of patient immobilized in extension for several weeks by his family physician after flare of gout. Anteroposterior (A) and lateral views (B).

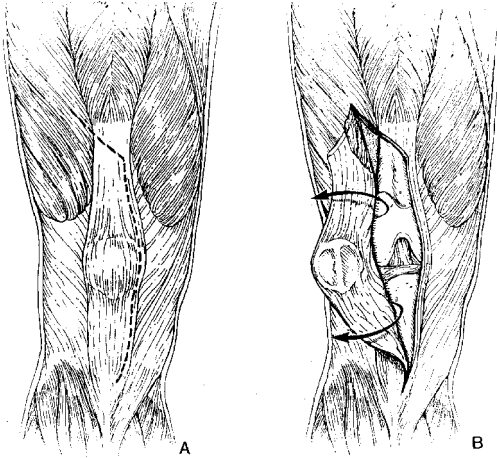


Figure 2. Quadriceps snip angled proximally in line with fibers of vastus lateralis.

Figures 2, 4 and 6 are reproduced from Barrack, R L: Specialized surgical exposure for revision total knee: quadriceps snip and patellar turndown, in Zuckerman J D (ed): Instructional Course Lectures, volume 48. Rosemont, IL, American Academy of Orthopaedic Surgeons, 1999.

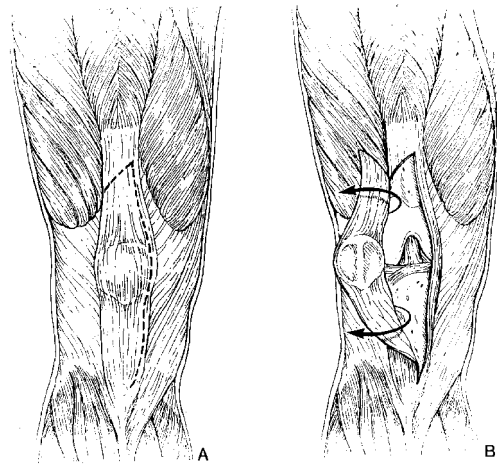


Figure 3. Modification of quadriceps snip oriented distally.

quent, potential complications are serious and include nonunion, fragmentation, migration, or fracture of the tibial tubercle, and wound breakdown over the fixation wires or cables. Skin slough in this area is a major risk factor for deep infection and frequently requires flap coverage. Because of concern over these potentially serious complications, I prefer the patellar turndown, except in cases with the specific indications noted above, which are relatively uncommon.

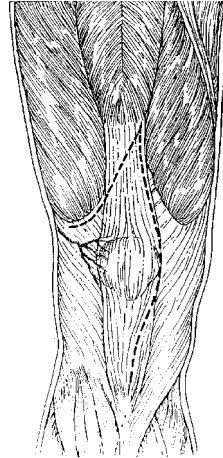


Figure 4. V-Y quadricepsplasty, as described by Scott and Siliski (1985), attempts to preserve the superior lateral geniculate artery.

### Surgical technique

The skin incision typically starts more proximally to the prior incision, in order to establish normal tissue planes. Dissection is carried through the prepatellar bursal layer, on the patella and retinaculum. The musculotendinous junction of the vastus medialis and vastus lateralis are identified. A standard medial parapatellar incision is performed. Adhesions in the medial and lateral gutters and in the suprapatellar pouch are released. This, together with a lateral release, often allows patellar eversion and flexion beyond 90° in knees with mild stiffness. In knees with moderate stiffness, the addition of a rectus snip often provides adequate exposure. This involves transection of the rectus tendon alone (Figure 2). This can be performed transversely or obliquely at a 45° angle oriented either proximally or distally (Figure 3). Orienting the rectus snip distally allows for conversion to a V-Y quadricepsplasty or a patellar turndown. The V-Y quadricepsplasty, as described by Scott and Siliski (1985), incises the rectus tendon and vastus lateralis tendon, but not the lateral retinaculum (Figure 4). It also preserves the superior lateral geniculate artery, which provides the major blood supply to the patella when a medial arthrotomy has been performed. This approach may not be adequate in the presence of a subluxated or dislocated patella, in which case an exten-



Figure 5. Intraoperative demonstration of complete ankylosis near full extension.



Figure 6. Intraoperative photograph outlining the incision of a patellar turndown.

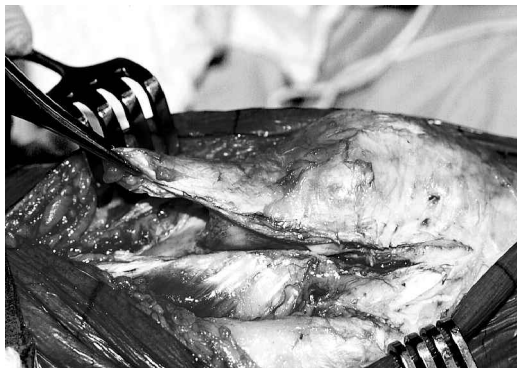


Figure 7. Completion of patellar turndown allows access for osteotomy of the patella from the anterior femur.



Figure 8. Complete flexion of the knee after disarticulation of the ankylosed tibiofemoral and patellofemoral joints.

sive lateral release will usually be necessary to restore normal patellar tracking.

For knees with marked stiffness or ankylosis, a complete patellar turndown is often necessary (Figure 5). The second incision begins at the apex of the medial parapatellar incision and proceeds obliquely across the rectus tendon, vastus lateralis, tendon, and lateral retinaculum to the level of the joint line (Figure 6). This invariably divides the superior lateral geniculate artery, but this has not been found to lead to a higher incidence of patellar complications (Ritter et al. 1996).

This incision allows exposure of the ankylosed knee, in which the patella is fused to the anterior femur (Figure 1). This also provides complete access to the tibiofemoral joint medially and laterally which requires disarticulation with an osteotomy in the case of the ankylosed knee (Figure 7). Wide exposure and complete flexion are usually

achieved easily with this approach (Figure 8). Many tibial inserts require insertion from a straight anterior direction. Adequate exposure allows these repeated maneuvers without undue tension on the patellar tendon in very stiff knees. Patellar turndown greatly facilitates insertion of tibial trials and inserts in such cases (Figure 9). The capsular incision is closed with heavy nonabsorbable suture. I would recommend burying the knots to avoid prominence under the skin. Three or four sutures are placed and the passive range of motion is tested. There should be substantial tension on the repair at 70–80° of flexion. If the knee flexes beyond 90° easily, this indicates that the repair should be done with more proximal advancement of the patella to reduce the risk of extension lag. If flexion is limited, distal advancement of the V-Y can be performed. Advancement of 5–10 mm is usually adequate. It is often possible to repair the



Figure 9. Complete exposure with components in place.



Figure 10. Repair of patellar turndown with lateral retinaculum left open.



Figure 11. Knee flexes to 70–80° with repair under tension, but sutures remain intact.

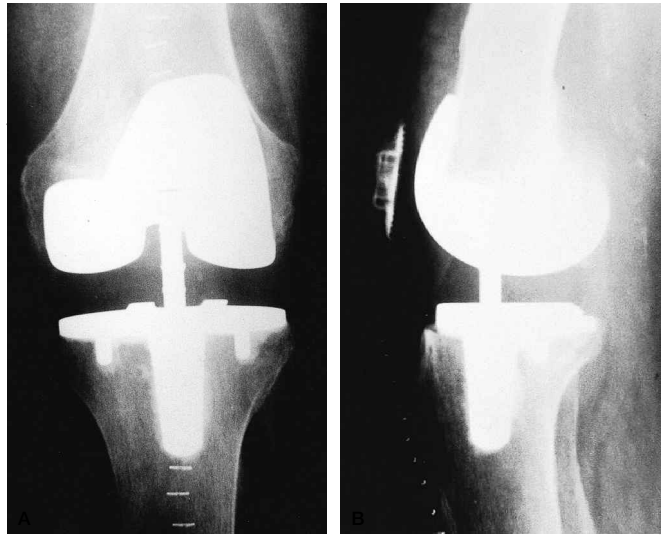


Figure 12. Postoperative AP (A) and lateral (B) radiographs of TKA in completely ankylosed knee performed with assistance of patellar turndown. Patient maintained 0–100° of motion at 1 year.

incision anatomically, since the release of all adhesions often permits adequate motion. The rectus tendon and vastus lateralis tendon are repaired, but the lateral retinacular incision is left open (Figure 10). At the completion of the repair, the suture line should be under tension, but remains competent at 70–80° of flexion (Figure 11).

The combination of a quadriceps snip and lateral release provides adequate exposure for most stiff knees. This approach has the advantage of not requiring modification of postoperative rehabilitation. In addition, clinical results have been shown to be equivalent to revising knees via a standard

medial parapatellar incision (Garvin et al. 1995, Barrack et al. 1998).

In the ankylosed knee, a patellar turndown provides excellent, expeditious exposure and successful completion of knee arthroplasty (Figure 12). A disadvantage of this approach is the requirement for slower, more involved rehabilitation to protect the soft tissue repair. Continuous passive motion is started immediately at 0–30° and increased to the point where the repair is noted to be tight intraoperatively (normally 60–70°). Active-assisted flexion is also allowed early with the same degree of restriction. Active straight leg-

- raising and isometric quadriceps exercise are delayed 4 to 6 weeks. Ambulation in a postoperative brace in extension is also advisable for the first 3 or 4 weeks to prevent "giving way" with sudden excessive flexing, which could jeopardize the repair. Extension lag normally resolves between 3 and 6 months. Persistent extension lag of 10-20° has been reported in 10-20% of cases, but is rarely disabling (Aglietti et al. 1989, Trousdale et al. 1993, Barrack et al. 1998).
- Aglietti P, Windsor R E, Buzzi R, Insall J N. Arthroplasty for the stiff or ankylosed knee. *J Arthroplasty* 1989; 4 (1): 1-5.
- Barrack R L, Smith P, Munn B, Engh G A, Rorabeck C. Comparison of surgical approaches in total knee arthroplasty. *Clin Orthop* 1998; 356: 16-21.
- Garvin K L, Scuderi G, Insall J N. Evolution of the quadriceps snip. *Clin Orthop* 1995; 321: 131-7.
- Ritter M A, Herbst S A, Keating E M, Faris P M, Meding J B. Patellofemoral complications following total knee arthroplasty: Effect of a lateral release and sacrifice of the superior lateral geniculate artery. *J Arthroplasty* 1996; 11: 368-72.
- Scott R D, Siliski J M. The use of a modified V-Y quadricepsplasty during total knee replacement to gain exposure and improve flexion in the ankylosed knee. *Orthopaedics* 1985; 8 (1): 45-8.
- Trousdale R T, Hanssen A D, Rand J A, Cahalan T D. V-Y quadricepsplasty in total knee arthroplasty. *Clin Orthop* 1993; 286: 48-55.
- Whiteside L A. Exposure in difficult total knee arthroplasty using tibial tubercle osteotomy. *Clin Orthop* 1995; 321: 32-5.
- Whiteside L A, Ohl M D. Tibial tubercle osteotomy for exposure of the difficult total knee arthroplasty. *Clin Orthop* 1990; 260: 6-9.