Total Knee Arthroplasty Rehabilitation Protocol
What Makes the Difference?

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Abstract: The goals of any rehabilitation protocol should be to control pain, improve ambulation, maximize range of motion, develop muscle strength, and provide emotional support. Over 85% of total knee arthroplasty (TKA) patients will recover knee function regardless of which rehabilitation protocol is adopted. However, the remaining 15% of patients will have difficulty obtaining proper knee function secondary to significant pain, limited preoperative motion, or the development of arthrofibrosis. This subset will require a special, individualized rehabilitation program that may involve prolonged oral analgesia, continued physical therapy, additional diagnostic studies, and occasionally manipulation. Controlling pain is the mainstay of any treatment plan. The program described herein has been used at the Ranawat Orthopaedic Center over the past 10 years in more than 2,000 TKAs. **Key words:** total knee, rehabilitation, continuous passive motion.

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Knee arthritis is a painful and disabling disease. Its progressive nature gradually restricts range of motion (ROM) and mobility. The deterioration in function coupled with increasing pain ultimately affects the patient’s social and emotional well-being as the patient finds it more and more difficult to participate in sporting activities and eventually in the activities of daily living (ADL).

The success of total knee arthroplasty (TKA), as determined by patient outcome studies, is not only due to the relief of pain and restoration of function, but also to the restoration of psychosocial health [1]. Therefore, the rehabilitative process after TKA should be designed to prepare the patient to resume ADL and sports activities. To achieve these goals, any rehabilitation protocol must control pain, provide emotional support, improve ambulation, maximize ROM, and develop muscle strength.

This article describes and evaluates a postoperative rehabilitation management protocol in terms of identifying and treating “painful TKA” and attaining postoperative ROM. This protocol has been used at the Ranawat Orthopaedic Center over the past 10 years in more than 2,000 TKAs.

Materials and Methods

Between January 1998 and December 2000, 181 consecutive patients underwent surgery at the Ranawat Orthopaedic Center using the same modular, metal-backed prosthesis (PFC Σ Posterior Stabilized, DePuy, Warsaw, IN). All components were fixed with cement. All patients were treated using the same standardized rehabilitation protocol as follows:

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1. Consultation with social work and visiting nurse services (VNS) in the immediate postoperative period.

2. Pain management consisting of continuous postoperative epidural anesthesia for 24–48 hours in conjunction with adjuvant femoral nerve block for 48 hours, with supplemental morphine patient-controlled analgesia and oral narcotics as needed.

3. Removal of compression dressings and closed suction drain after 24 hours.

4. Mechanical compression boots used continuously for 72 hours.

5. Continuous passive motion (CPM) started on the first postoperative day from 0°–60° and increased as tolerated.

6. Physical therapy started on the first postoperative day to aid in progressive, protected ambulation as well as isometric and ROM exercises.

7. Deep venous thrombosis (DVT) prophylaxis with warfarin sodium started 2 hours preoperatively and continued postoperatively (target INR, 1.5–2.0) for 3 days until performance of Doppler ultrasound. If ultrasound is negative for DVT, patient discontinues warfarin and begins a course of aspirin for 6 weeks. If the ultrasound demonstrates a DVT, the patient completes a 6 week course of warfarin followed by repeat ultrasound if symptoms persist.

8. Patients are discharged home, to inpatient rehabilitation, or to a skilled nursing facility based on individual need in consultation with social work, VNS, and home health services.

9. Patients are followed up routinely at 6 weeks, 3 months, and 1 year after surgery.

10. Identification of “painful TKA” during the first postoperative visit. If significant pain with associated limitation of function persists after uncomplicated TKA, further workup is mandatory. Significant pain is defined as > 3 out of 10 on a visual analog pain scale using a patient-administered questionnaire or pain requiring narcotic use. First, infection and mechanical instability must be ruled out. The patient is then begun on a prolonged narcotic regimen (such as hydrocodone) with synergistic analgesia (eg, amitriptyline 25 mg × 2 weeks) to control pain and enable sleep. Progress is monitored closely, with continued physical therapy and repeated office visits every 6 weeks. In refractory cases in which no surgical intervention is deemed appropriate, patients are referred to a pain management consultation.

All patients were followed prospectively. Data were collected using Excel (Microsoft, Redmond, WA). Instat Statistical software (Graphpad, San Diego, CA) was used for unpaired student t-tests to compare differences between groups. P values <.05 were considered significant.

**Results**

For this study, 181 patients (207 knees) were initially identified. Five patients (6 knees) had died. Fifty-four patients (62 knees) had incomplete data or less than 12 months of follow-up information, leaving a study group of 120 patients (139 knees). Follow-up time averaged 31 months (range, 12–55 months). The average patient age was 69 years (range, 35–89 years); 72 patients were women and 48 were men. The average patient weight was 178 lb (range, 100–315 lb). The diagnosis was osteoarthritis in 134 knees, post-traumatic disorders in 3, and rheumatoid arthritis in 2. In this study, 109 knees had varus deformity and the remaining 30 knees were in valgus. There were 19 bilateral cases (13 staged and 6 simultaneous).

At the routine 6-week follow-up evaluation, only 12 patients (10%) had a ROM < 90°. Ten patients (9%) had a mild flexion contracture of < 10°. Fifteen patients (13%) had significant pain and limitations requiring prolonged narcotic use and synergistic analgesia during the first postoperative visit. Of these, 10 patients were women, and 5 were men. Age averaged 72 years (range, 57–80; P=.53). Weight averaged 174 lb (range, 128–223; P=.64). There were no bilateral cases. Preoperative ROM for the painful knee group averaged 111° (range 80°–130°). ROM attained at the 6-week postoperative evaluation was significantly less than for the nonpainful knee group (97° vs 118°; P=.04). However, ROM did improve with each subsequent office visit, to a final average of 119° (range, 95°–125°). Average number of office visits for the painful knee group was 6.2, compared with 4.5 for the nonpainful group (P=.001).

Two cases of infection required implant removal. There were 3 re-operations (1 for instability, 1 for peripatellar fibrosis, and 1 for delayed wound healing). One revision for laxity was pending. Two successful manipulations were performed. The DVT rate was 3.1%.

At 1-year follow-up, 9 of 10 patients who did not undergo repeat operation had resolution of significant pain and were fully ambulatory. One patient continues to have difficulty, with significant limitation to ROM (10°–80°).
Discussion

The take-home message is that the vast majority of patients (over 85%) will recover knee function, including ROM, regardless of which postoperative regimen is used [2–4]. Nonetheless, it requires a multidisciplinary effort involving anesthesia, physical therapy, social services, and, frequently, impatient rehabilitation.

Most published literature regarding rehabilitation protocols focus on the use of CPM, attaining ROM, assessing the need for manipulation, and decreasing length of stay [5–7]. Although no consensus has been reached regarding optimal rehabilitation strategies, the goal must be to prepare patients so that they can participate in ADL or return to sporting activities. To accomplish this, it is necessary to control pain, provide emotional support, improve ambulation, maximize ROM, and develop muscle strength. Using this same protocol with a different cohort of patients, 92% were able to return to sporting activities defined as vigorous walking, swimming, tennis, or golf at the end of 1 year [8].

In this observational study, postoperative ROM was directly related to preoperative ROM [9]. In no cases was ROM > 110° in patients with preoperative ROM < 90°. Similarly, there were no cases of ROM < 110° in patients with preoperative ROM > 90°.

The use of CPM is controversial [10–25]. In the senior author’s opinion (C.S.R.), CPM in conjunction with physical therapy facilitates recovery of knee function and, more importantly, has become the community standard. Nonetheless, no study to date has offered conclusive evidence of the long-term benefits with the use of CPM.

However, it is the subset of patients (approximately 15%) that experience “painful TKA” that require special attention. The recovery of knee function in this group, including ROM, is hampered by significant pain, limited preoperative ROM, or early arthrofibrosis. These patients need to be identified and followed up closely. The focus of individualized regimens for them should be on controlling pain in conjunction with continued physical therapy and frequent office visits. The rehabilitation protocol described herein has been used at the Ranawat Orthopaedic Center in more than 2,000 TKAs over the past 10 years.

References

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