I. IMMEDIATE POST-OPERATIVE PHASE

POD 1

Brace - Brace locked at zero degrees extension for ambulation

Weight Bearing - Two crutches as tolerated (less 50 %)

Range of Motion - Full passive extension (0-90 degrees)

Exercises

* Ankle pumps
* Passive knee extension to zero
* Straight leg raise (flexion)
* Hip Abd/Adduction
* Knee Extension 90-40 degrees
* Quad sets
* Hamstring stretch

Muscle Stimulation - Muscle stimulation to quads (4-6 hours per day) during active exercises & ADL’s

CPM - Zero to 90 degrees

Ice and Evaluation - Ice 20 minutes out of every hour and elevate with knee in extension

POD 2 to 7

Brace - Brace locked at zero degrees extension for ambulation

Weight Bearing - Two crutches as tolerated

Range of Motion - Patient out of brace 4-5 times daily to perform self ROM 0-90/100 degrees

Exercises

* Intermittent ROM exercises (0-90 degrees)
* Patellar mobilization
* Ankle pumps
* Straight leg raises (4 directions)
* Standing weight shifts and mini squats [(0-30) ROM]
* Knee extension 90-40 degrees
* Continue quad sets

Muscle Stimulation - Electrical muscle stimulation to quads (6 hours per day)

CPM - Zero to 90 degrees

Ice and Elevation - Ice 20 minutes out of every hour and elevate with knee in extension

Criteria for discharge from hospital

* Independent with ambulation with crutches including up/down stairs
* Independent with home exercise program
* PROM 0-90 degrees
* Independent with equipment, i.e., brace, crutches and electrical muscle stimulation.
II. **MAXIMUM PROTECTION PHASE (Week 2-8)**

Goals: Absolute control of external forces and protect graft  
Nourish articular cartilage  
Decrease swelling  
Prevent quad atrophy

A: **Week Two**

Brace - Brace locked at zero degrees for ambulation only, unlocked for self ROM (4-5 times daily)

Weight Bearing - As tolerated (goal to discontinue crutches 7-10 days post op)

Range of Motion - Self ROM (4-5 times daily), emphasis on maintaining zero degrees passive extension

KT 2000 Test - (15 lb. anterior-posterior test only)

Exercises

* Multi-angle isometrics at 90, 60, 30 degrees  
* Leg raises (4 planes)  
* Hamstring curls (isometrics)  
* Knee extension 90-40 degrees  
* Mini squats (0-40) and weight shifts  
* Lunges  
* Leg Press (0-60)  
* PROM/AAROM 0-105 degrees  
* Patellar mobilization  
* Hamstring and calf stretching  
* Proprioception training  
* Well leg exercises  
* PRE Program - start with 1 lb., progress 1 lb. per week

Swelling control - Ice, compression, elevation

B: **Week Four**

Brace - Brace locked at zero degrees for ambulation only, unlocked for self ROM (4-5 times daily)

Range of Motion - Self ROM (4-5 times daily), emphasis on maintaining zero degrees passive extension

Exercises

* Same as week two  
* PROM 0-125 degrees  
* Bicycle for ROM stimulus and endurance  
* Pool walking program, swimming  
* Initiate eccentric quads 40-100 (isotonic only)  
* Leg press (0-60)  
* Emphasize CKC exercise  
* Stairmaster  
* Nordic Track

KT 2000 Test - (Week 4, 20 lb. anterior and posterior test)
Phase Two: Continued

C: Week Six

Brace - Discontinue use of drop locked brace

Exercises

* Same as week four
* Hamstring Curls (light resistance)
* Pool Program
* AROM 0-115 degrees
* PROM 0-125 degrees
* Emphasize closed chain exercises
* Bicycle/Stairmaster etc.

KT 2000 Test - (Week 6, 20 lb. and 30 lb. anterior and posterior test)

D: Week Eight

Brace - Consider use of functional brace

Exercises - Continue PRE program

KT 2000 Test - (Week 8, 20 lb. and 30 lb. anterior and posterior test)

III. MODERATE PROTECTION PHASE (Week 10-16)

Goals: Maximal strengthening for quads/lower extremity
        Protect patellofemoral joint

A: Week 10

Exercises

* Knee extension (90-40 degrees)
* Leg press (0-60)
* Mini squats (0-45)
* Lateral step ups
* Hamstring curls
* Hip Abd/Add
* Toe/calf raises
* Bicycle
* Stairmaster
* Wall Squats
* Lunges
* Pool running
* Proprioceptive training
* Continue PRE progression (no weight restriction)

B: Week 12-14

Exercise - Continue all above exercises

Testing - Isokinetic Test (180/300 degrees/sec, Full ROM, 10/15 reps)
          KT 2000 Test - Total Displacement at 15 lb., 20 lb. and 30 lb., Manual Maximal Test

Maintain/Begin running (if patient fulfills criteria)
IV. LIGHT ACTIVITY PHASE (Month 4-5)

Criteria to Enter Phase IV

* AROM 0-125 degrees >
* Quad strength 70% of contralateral side, knee flexor/extensor rated 70-79%
* No change in KT scores (+2 or less)
* Minimal/no effusion
* Satisfactory clinical exam

Goals: Development of strength, power, endurance
Start gradual return to functional activities

A: Week 20-21

Exercises

* Emphasize eccentric quad work
* Continue closed chain exercises, step-ups, mini-squats, leg press
* Continue knee extension 90-40 degrees
* Hip abduction/adduction
* Initiate plyometric program
* Initiate running program
* Initiate agility program
* Sport specific training and drills
* Hamstring curls and stretches
* Calf raises
* Bicycle for endurance
* Pool running (forward/backward)
* Walking program
* Stairmaster
* High speed isokinetics

Testing - Isokinetic Test (180/300 degrees/sec, Full ROM, 10/15 reps)
KT 2000 Test - Total Displacement at 15 lb., 20 lb. and 30 lb., Manual Maximal Test

Criteria for Running

Isokinetic Test - 85% > of opposite leg (quads), 90% > of opposite leg (hamstring)
Isokinetic Test - Quad torque/body weight (180 degrees/sec) (60-65% males)(50-55% females)
KT 2000 Test - Unchanged
No Pain/Swelling
Satisfactory clinical exam

Functional Drills

* Straight line running
* Jog to run
* Walk to run
### V. RETURN TO ACTIVITY PHASE (Month 6 - 7)

**Goals:**
- Achieve maximal strength & endurance
- Return to sport activities

* Continue strengthening program for one year from surgery

<table>
<thead>
<tr>
<th>4 Quads</th>
<th>4 Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee Extensions</td>
<td>Hamstring Curls</td>
</tr>
<tr>
<td>Wall Squats</td>
<td>Calf Raises</td>
</tr>
<tr>
<td>Leg Press</td>
<td>Hip Abduction</td>
</tr>
<tr>
<td>Step Ups</td>
<td>Hip Adduction</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4 Endurance</th>
<th>4 Stability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle</td>
<td>High Speed Hamstrings</td>
</tr>
<tr>
<td>Stairmaster</td>
<td>High Speed Hip Flexion/Extension</td>
</tr>
<tr>
<td>Nordic Trac</td>
<td>Balance Drills</td>
</tr>
<tr>
<td>Swimming</td>
<td>Backward running</td>
</tr>
<tr>
<td>*Pick One</td>
<td></td>
</tr>
</tbody>
</table>