POSTOPERATIVE REHABILITATION PROTOCOL FOLLOWING JUVENILE ACL RECONSTRUCTION

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STAGE	AIMS	GOALS	TREATMENT GUIDELINES
Prehabilitation	▪ Prepare the patient for surgery	▪ Full ROM ▪ Painfree mobile joint ▪ Teach simple post op exercises	▪ Operate on pain free mobile joints – minimizes complications and speeds recovery ▪ May take many months ▪ Do not be pressured by patient into early surgery. ▪ Preprogramming post operative rehabilitation is beneficial at every level ▪ Patients are better able to manage postoperative exercises if they have learnt them before surgery
Stage I Acute Recovery Day 1 to Day 10-14	▪ Post-operative pain relief and management of soft tissue trauma. ▪ Progress off crutches and normal gait.	▪ Wound healing. ▪ Manage the graft donor site morbidity, i.e. pain and swelling. ▪ Decrease joint swelling. ▪ Restore full extension (including hyperextension) ▪ Ensure brace is fitted well if prescribed ▪ Establish muscle control.	▪ Decrease swelling & pain with ice, elevation, co-contractions and pressure pump. ▪ Partial weight bearing to full weight bearing as pain allows. ▪ Aim for a full range of motion using active and passive techniques. ▪ If a brace has been applied ensure it is properly fitted and follow the instructions on removal for active range of motion exercises. ▪ Patella mobilisations to maintain patella mobility. ▪ Gait retraining with full extension at heel strike. ▪ Return of co-ordinated muscle function encouraged with biofeedback. Active quadriceps strengthening is begun as a static co-contraction with hamstrings emphasising VMO control at various angles of knee flexion and progressed into weight bearing positions. ▪ Gentle hamstring stretching to minimise adhesions in autograft . ▪ Active hamstring strengthening begins with static weight bearing co-contractions and progresses to active free hamstring contractions by day 14. ▪ ALLOGRAFT patients can start active and resisted hamstring strengthening immediately postop. ▪ Resisted hamstring strengthening should be avoided for at least 6 weeks in autograft patients.
Stage II Hamstring And Quadriceps Control 2-12 Weeks	▪ To return the patient to "normal" daily function. ▪ Prepare the patient for Stage III.	▪ Develop good muscle control and early proprioceptive skills. ▪ If not done sooner, restore a normal gait. ▪ Reduce any persistent or recurrent effusion.	▪ Progress co-contractions for muscle control by increasing the repetitions, length of contraction and more dynamic positions, e.g. two leg quarter squats, lunges, stepping, elastic cords. ▪ Gym equipment can be introduced gradually such as exercise bike, stepper, leg press, mini trampoline, cross trainer. ▪ If swelling is persistent, continue with pressure pump and ice ▪ Hamstring strengthening progresses in both power and speed of contraction ▪ Consider beyond the knee joint for any deficits, e.g. gluteal control, tight hamstrings, ITB, gastrocs and soleus, etc.
Stage III Proprioception 12-24 weeks	▪ Improve neuromuscular control and proprioception.	▪ Continue to improve total leg strength. ▪ Improve endurance capacity of muscles. ▪ Improve confidence and muscle reaction time.	▪ Progress co-contractions to more dynamic movements, e.g. step lunges, half squats. ▪ Proprioceptive work more dynamic, e.g. lateral stepping, slide board etc. ▪ Can begin jogging in straight lines on the flat. ▪ Progress resistance on gym equipment such as leg press and hamstring curls. ▪ Start cycling on normal bicycle. ▪ Swimming in a pool (not surf) can be commenced (no flippers) ▪ Consider pelvic and ankle control plus cardiovascular fitness. ▪ Open chain quads exercises commence (if no patellofemoral symptoms) 40-90^0 progressing through to full range of motion.
Stage IV Strength & Endurance 4-6months	▪ Continue to improve strength, endurance and proprioception	▪ Facilitation of strength, endurance and proprioception with both functional and gym based exercises	▪ Continue to progress strengthening with dynamic functional exercises ▪ Commence change of direction/diagonal running if adequate control of hip and knee is achieved ▪ Utilise resistance/weights for open chain quads exercises if no patellofemoral symptoms ▪ Continue to improve cardiovascular fitness, strength and neuromuscular control utilising both gym equipment and an outdoor program, commencing sport specific skills as appropriate.

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Stage V **Sport Specific** **6-10 months**	▪ Prepare to return to sport.	▪ Incorporate more sport specific activities. ▪ Introduce agility and reaction time into proprioceptive work. ▪ Increase total leg strength. ▪ Develop patient confidence.	▪ Progressing of strength work, e.g. half squats with resistance, leg press & curls, wall squats, step work on progressively higher steps, stepper & rowing machine. ▪ Proprioceptive work should include plyometric (hopping and jumping) activities and emphasise a good landing technique. Incorporate lateral movements. ▪ Agility work may include shuttle runs, ball skills, sideways running, skipping, etc. ▪ Low impact and step aerobics classes help with proprioception and confidence. ▪ Pool work can include using flippers. ▪ Sport specific activities will vary for the individual, e.g. Tennis - lateral step lunges, forward and backwards running drills: Skiing - slide board, lateral box stepping and jumping, zigzag hopping; Volleyball or Basketball - vertical jumps.
Stage VI **Return To Sport** **10-12 Months**		▪ Return to sport safely and with confidence.	▪ Continue progression of plyometrics and sport specific drills. ▪ Return to training and participating in skill exercises. ▪ Continue to improve power and endurance. ▪ Advice may be needed as to the need for modifications to be able to return to sport, e.g. Football - start back training in running shoes or short sprigs. Will usually return to lower grades initially; Skiing - stay on groomed slopes and avoid moguls and off piste initially. Racers may initially lower their DIN setting on the bindings. ▪ Train in PEP program for warm up to reduce further ACL injury *1.Warm-up (50 yards each):* • *Jog line to line of soccer field (cone to cone)* • *Shuttle run (side to side)* • *Backward running* *2. Stretching (30 s* × 2 reps each): • Calf stretch • Quadricep stretch • Figure 4 hamstring stretch • Inner thigh stretch • Hip flexor stretch 3. Strengthening: • Walking lunges (20 yards × 2 sets) • Russian hamstring (3 sets × 10 reps) • Single toe-raises (30 reps on each side) 4. Plyometrics (20 reps each): • Lateral hops over 2 to 6 inch cone • Forward/backward hops over 2 to 6 inch cone • Single leg hops over 2 to 6 inch cone • Vertical jumps with headers • Scissors jump 5. Agilities: • Shuttle run with forward/backward running (40 yards) • Diagonal runs (40 yards) • Bounding run (45–50 yards) *Ref: Gilchrist et al AJSM 2008* ▪ Supplementary information and exercises can also be seen on the FIFA website: http://f-marc.com/11plus/home/ ⇨ **NB** We have previously identified **2 high risk groups for re-injury**, patients under 21 years and patients with mildly increased laxity (Pinczewski et al AJSM 2007). Both these groups have a significantly increased risk of re-injury therefore we advise refraining from full competitive sports for the full 12 months in these patients

OUTLINE OF THE SURGICAL PROCEDURE

The knee joint is examined via the arthroscope. Meniscal surgery is performed as required and the ruptured ACL stumps are removed. Via a 2cm incision on the anterior tibia the semitendinosus and gracilis hamstring tendons are harvested at about 20 cm up the medial thigh. The two tendons are doubled over to create a 4 strand graft and sutured together at both ends. The tunnels for the graft are drilled through the tibia and femur and the graft pulled into place in an anatomic position. The graft is secured with interference screws in both the femur and tibia. Full ROM is achieved prior to final tibial fixation. The wounds are closed then closed. Patients may weight bear as tolerated immediately after surgery and in some instances be placed in a brace for a short period postoperatively. For the vast majority of patients this is a day surgery procedure.