and chart review after a minimum of 5 years. Patient-reported outcomes were assessed using Knee Injury and Osteoarthritis Outcome Scores (KOOS), International Knee Documentation Committee (IKDC) Subjective Knee Form scores, and Marx activity scores.

Average follow-up at 7 years (range, 5 to 13) was obtained for 90% of the 81 patients (mean age, 27 years; range, 14 to 54 years). Within the final cohort, there were 26 isolated repairs and 49 repairs combined with ACLR. *Time to failure* was defined as the interval between index meniscal repair and repeat repair or meniscectomy.

Failed meniscal repairs were noted in 16% (n = 12) of the total cohort at a mean of 47 months (range, 15 to 95). Similar failure rates were noted for medial (18%) and lateral (8.0%) meniscal repairs (p = .744). Isolated repairs failed at a rate of 11.5% (95% CI, –.76 to 23.75) compared with 18.3% (95% CI, 7.5 to 29.1; p = .526) for the combined procedure. Individual failure rates are shown in Table 1. Patient age, sex, number of sutures, length of follow-up, or type of procedure (isolated vs combined) did not affect the meniscal failure rate.

Table 1. Meniscus Failure Rate After Mean of 5 Years

	Isolated Repair	Combined Procedure	p Value
Total failure rate (%)	11.5	18.3	0.526
Lateral failure rate (%)	0	2.0	1.0
Medial failure rate (%)	18.8	17.6	0.250
Time to failure (months)	48.1	46.6	0.939

Postoperative KOOS and IKDC scores were similar between the isolated and combined treatment groups. Marx activity scores were significantly (p = .03) higher in patients having isolated meniscus repair compared with those having both meniscus repair and ACLR.

This study is limited by its retrospective nature, a definition of *meniscal failure* that may underestimate true repair failure, and possible insufficient patient numbers to detect a difference between isolated repairs and those performed with ACLR. Despite this, it is apparent that second-generation all-inside meniscal repair devices improved long-term (> 5 years) failure rates compared with first-generation repair devices and were equal to those of inside-out, outside-in, and open repairs. Equivalent long-term failure rates were also noted with isolated repairs compared with repairs performed with concurrent ACLR. Meniscal repair with a second-generation all-inside repair system is a reliable technique with good longevity.

FNB Associated With Persistent Muscle Weakness in Pediatric and Adolescent Patients

Written by Brian Hoyle

T. David Luo, MD, Mayo Clinic, Rochester, Minnesota, USA, reported on a study that demonstrated long term deficits in muscle strength when anterior cruciate ligament (ACL) reconstruction was accompanied by femoral nerve blockade (FNB) in pediatric and adolescent patients.

FNB is often used to provide analgesia following ACL reconstructive surgery. Although rare, femoral neuropathy can occur, producing weakness, numbness, and pain. The effect that FNB complications might have on patients ≤ 18 years has been unclear.

The retrospective, matched cohort study compared outcomes at 6 months after ACL reconstructive surgery in 169 pediatric and adolescent patients whose surgery, conducted from 2001 to 2010, involved FNB or did not (control). The nerve blockade was accomplished using 20 to 50 ml of .25% or .5% marcaine under nerve stimulator or ultrasound guidance. Because of revision ACL surgery or prior ipsilateral or contralateral knee surgery, 45 patients were excluded. The remaining 124 patients comprised 62 patients in the FNB group (46 via continuous flow over 48 hours, 16 by single injection) and 62 patients in the control group.

The 6-month outcomes were isokinetic strength and function during slow extension and flexion (both 60° per second), fast extension and flexion (both 180° per second), vertical jump, triple jump, and single leg hop. The return to sports of the patients was also assessed. The cohorts were matched for baseline demographics (Table 1).

Table 1. Demographics of the Matched Cohorts

	FNB (n = 62)	Control (n = 62)	p Value
Mean age at surgery	16.2 ± 1.5	15.9 ± 1.4	0.263
Sex	31 M 31 F	25 M 37 F	0.279
BMI	23.7 ± 4.1	23.8 ± 3.6	0.890
Tegner score	8.4 ± 1.0	8.2 ± 1.0	0.295

BMI=body mass index; FNB=femoral nerve blockade.

Concerning surgical factors, the autograft type in patients who received a FNB was predominantly bone-patellar tendon-bone (69%), with hamstring autograft used in 31% of cases. The control group comprised

similar percentages of each graft (66% bone-patellar tendon-bone autograft, 34% hamstring autograft). No differences were evident between the groups concerning concomitant procedures, including meniscus and cartilage repair, the type of anesthesia, or mechanism of injury. Significant differences were evident between the FNB and control groups in terms of tourniquet time (81.61 ± 17.9 vs 92.9 ± 17.2 min; p = .002), operative time (134.2 ± 29.4 vs 155.3 ± 45.1 min; p = .003), and anesthesia time (176.6 ± 29.6 vs 199.5 ± 43.0 min; p = .001).

Diminished isokinetic strength at 6 months, measured as fast and slow extension and fast and slow flexion, was more prevalent in patients who received FNB; these differences were significant for fast extension and for fast and slow flexion. Functional testing at 6 months did not reveal significant differences between the patient groups.

At 6 months, 90% of the patients in the control group and 68% of patients who received FNB following ACL reconstruction were cleared for a progressive return to pre-injury sports activities. The difference between the groups was significant (p = .002). Return to sports adjusted for surgical variables revealed significant associations with tourniquet time (OR, 5.6; p = .005), operative time (OR, 5.3; p = .003), and anesthesia time (OR, 6.7; p = .001).

The study findings indicate an association of FNB and significant isokinetic deficits in knee extension and flexion strength at 6 months postoperatively. In addition, the use of FNB delays patient return to sports activities at 6 months.

FNB During ACLR Delays Recovery of Quadriceps Muscle Strength

Written by Brian Hoyle

Robert A. Magnussen, MD, MPH, Wexner Medical Center, Ohio State University, Columbus, Ohio, USA, presented the findings of a randomized controlled trial on the effect of femoral nerve block (FNB) on quadriceps muscle strength and patient-reported outcomes following anterior cruciate ligament (ACL) reconstruction.

ACL reconstruction (ACLR) in athletes seeks to restore knee stability to withstand abrupt sports-related directional changes and pivoting. Postoperative rehabilitation often involves the restoration of quadriceps muscle strength to permit optimal sports performance and reduce the risk of re-injury. Blocking the function of the femoral nerve perioperatively can be done as a means of pain relief. Whether the approach hampers recovery of the quadriceps muscle is unclear [Atchabahian A et al. *Anesthesiology* 2001].

The trial addressed the hypotheses that perioperative FNB would result in significantly diminished strength in the lower quadriceps muscle 6 weeks after ACLR, as compared with preoperative muscle strength, and that postoperative improvements reported by patients would be delayed when FNB was used perioperatively.

Thirty patients who had experienced acute ACL injury and whose ACLR involved a hamstring autograft were randomly assigned to a group receiving a single injection of 20 mL of .5% ropivacaine using ultrasound guidance (n = 14) or a control group (n = 16) not receiving the FNB. Both groups underwent standard accelerated rehabilitation with weight bearing as tolerated and no braces. All patients were assessed preoperatively and at 12 weeks postoperatively using the patient-reported Knee Injury and Osteoarthritis Outcome Score (KOOS), and isokinetic strength was tested at 60° per second. A 6-week postoperative assessment for all patients included KOOS and isometric strength testing at 90° of flexion.

Patients in both groups were similar preoperatively in age, gender composition, height, weight, body mass index, limb symmetry, and patient-assessed activities of daily living (ADLs), pain, and symptoms (Table 1).

No surgical or nerve block complications were evident, and clinically detectable femoral nerve palsy was absent in all patients throughout the follow-up period. Comparisons prior to ACLR and 6 weeks after surgery revealed that quadriceps strength did not vary significantly between the left and right legs in the absence of FNB, whereas nerve block was associated with

Table 1. Preoperative Characteristics in Patient Groups

	No Block (n = 16)	Block (n = 14)	Significance
Age (years)	20.8 ± 9.1	23.9 ± 9.4	p = .35
Sex	7 male 9 female	4 male 10 female	p = .47
Height (m)	1.72 ± 0.08	1.73 ± 0.09	p = .69
Weight (kg)	74.4 ± 13.6	82.7 ± 16.1	p = .14
BMI (kg/m^2)	25.1 ± 3.9	27.6 ± 5.7	p = .16
Limb symmetry	0.77 ± 0.23	0.80 ± 0.14	p = .70
KOOS—ADL	87.6 ± 10.2	85.9 ± 13.1	p = .69
KOOS—pain	74.0 ± 11.0	75.6 ± 11.6	p = .69
KOOS—symptoms	61.4 ± 17.7	66.8 ± 17.1	p = .41

BMI=body mass index; KOOS=Knee Injury and Osteoarthritis Outcome Score.