Clinical Outcomes and Return to Sport After Quadriceps Tendon Autograft ACL Reconstruction: Comparison to Bone-Patellar Tendon-Bone Autograft at a Minimum 2-Year Follow-Up

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DISCLOSURES

Our disclosures can be found on the ISAKOS Congress website.

BACKGROUND

- ACL tears are a common orthopaedic injury and ACL reconstruction (ACLR) is one of the most common orthopaedic procedures but the **ideal graft choice for ACLR is still subject to debate**[1,2]

- **Quadriceps tendon (QT)** autograft for ACLR has been proposed as an alternative to **bone-patellar tendon-bone (BTB)** autograft in young, high-demand patients to achieve **comparable clinical outcomes while avoiding complications** associated with BTB autograft[3-5]

- However, the **relative efficacy** of QT autograft compared to BTB autograft has not yet been well-described and few studies have reported patient satisfaction, rate of return to sport, rate of reinjury, and psychological readiness for return to sport at **short-term follow-up following QT ACLR**[6]

METHODS

- All patients who underwent **primary ACLR** between the ages of **12 and 45 years old** with all soft tissue QT autograft **between January 2018 and February 2020** were identified in a single institutional registry

- Patients were **matched 1:2** to a control group of patients who underwent BTB autograft ACLR on the basis of **age and sex**

- **Exclusion Criteria:**
  - Patients that had a **lateral extra-articular augmentation procedure** (i.e., LET/ALLR)
  - Patients that underwent additional **concomitant ligament surgery**
  - Patients that underwent additional **cartilage surgery** or **knee osteotomy**

- Patients were **contacted at a minimum of 24 months post-surgery** and the following outcomes measures were evaluated:
  - PROMIS Mobility
  - PROMIS Pain Interference
  - IKDC Subjective Knee Evaluation
  - Marx Activity Score
  - SANE Score
  - Report to sport
  - Graft re-rupture rates
  - Re-operation rates

RESULTS

Baseline Characteristic	Mean ± SD / N		P-Value
	BTB (n=87)	QT (n=50)	
Age (years)	22.8 ± 7.3	22.6 ± 9.1	0.901
Sex	46 M, 42 F	21 M, 29 F	0.246
BMI	24.7 ± 3.5	24.3 ± 5.0	0.592
Race	70 white, 6 black, 4 Asian, 1 Amer. Indian/AK native, 7 other/declined	33 white, 5 black, 2 Asian, 0 Amer. Indian/AK native, 10 other/declined	0.237
Ethnicity	79 not Hispanic/Latino, 7 Hispanic/Latino, 2 refused	36 not Hispanic/Latino, 13 Hispanic/Latino, 1 refused	**0.015**
Laterality	46 L, 42 R	22 L, 28 R	0.350
Concomitant procedure	83 none, 2 PRP injection, 1 debridement of fat pad, 1 excision of lateral pica, 1 removal of hardware	47 none, 1 chondroplasty medial femoral condyle, 1 MCL plication, 1 PRP injection	0.322
Meniscectomy	57 N, 31 Y	42 N, 8 Y	**0.016**
Meniscectomy laterality	2 both, 25 lateral, 4 medial	0 both, 5 lateral, 3 medial	0.231
Meniscus (partial/full)	31 partial, 0 full	9 partial, 0 full	NA
Repair	63 N, 25 Y	30 N, 20 Y	0.163
Repair laterality	3 both, 8 lateral, 0 lateral root, 14 medial	2 both, 9 lateral, 1 lateral root, 8 medial	0.500

- BTB group had significantly **higher % of Not Hispanic or Latino patients** than QT group
- QT group had significantly **lower percentage of meniscectomies** at index procedure

RESULTS

Metric	Mean ± SD / N		P-Value
	BTB (n=87)	QT (n=50)	
Follow up (d)	952.9 ± 175.7	942.8 ± 231.8	0.774
Knee grade	83.0 ± 22.3	87.2 ± 14.8	0.268
Return (mos)	11.7 ± 7.5	13.6 ± 8.2	0.369
Confident to play sport	80.6 ± 23.3	82.5 ± 23.6	0.669
Confident @ pre-injured lvl	79.4 ± 27.2	81.6 ± 27.9	0.672
Confident knee won't give way	79.7 ± 24.2	85.85 ± 19.1	0.156
Return to sport experience	4.8 ± 3.6	8.1 ± 2.4	**0.000**
ACL-RSI score	68.3 ± 27.5	76.2 ± 25.9	0.128
Before lvl of sport	1 none, 15 recreational, 19 HS, 22 amateur, 14 college, 5 semi-pro/pro, 12 missing	1 none, 18 recreational, 13 HS, 5 amateur, 6 college, 2 semi-pro/pro, 5 missing	0.099
Able to play today	20 N, 56 Y, 12 missing	6 N, 39 Y, 5 missing	0.093
Same lvl before injury	37 yes, 9 no, afraid of re-injury, 4 no, physical limitations, 13 no, other reasons not due to knee	28 yes, 1 no, afraid of re-injury, 3 no, physical limitations, 7 no, other reasons not due to knee	0.173

- QT group had **significantly higher Return To Sport Experience scores** than the BTB group

RESULTS

Metric	Mean ± SD / N		P-Value
	BTB (n=87)	QT (n=50)	
Plan on return	10 N, 10 Y	4 N, 2 Y	0.652
After lvl of sport	3 none, 22 recreational, 8 HS, 10 amateur, 9 college, 3 semi-pro/pro, 33 missing	1 none, 27 recreational, 6 HS, 3 amateur, 1 college, 1 semi-pro/pro, 11 missing	0.061
Another knee surgery	10/75 (13%)	13/47 (28%)	**0.049**
Ipsilateral reoperations	9/87 (10%)	13/50 (26%)	0.016
Reoperation for graft failure	2/87 (2%)	1/50 (2%)	1.000
Satisfaction	51 very satisfied, 8 somewhat satisfied, 2 neutral, 5 somewhat dissatisfied, 22 missing	32 very satisfied, 8 somewhat satisfied, 0 neutral, 5 somewhat dissatisfied, 5 missing	0.482
Back in time	2 N, 64 Y, 22 missing	2 N, 43 Y, 5 missing	1.000
Sooner	47 N, 19 Y, 22 missing	28 N, 17 Y, 5 missing	0.321

- QT group had **higher frequency of subsequent surgery** than the BTB group

RESULTS

- Total of **137 patients** (50 QT patients, 87 BTB patients)
  - 71 M, 65F
  - Mean **age 22.8 years** (range 13-47 years)
  - Mean **follow up 31.1 months** (minimum 24 months)

- While not statistically significant, **87% of QT patients indicated they were able to RTS compared to 74% of BTB patients** (P=0.093)

- **Patient satisfaction with outcome was high** for both groups, with 89% of QT patients and 89% of BTB patients reporting being very satisfied or somewhat satisfied with results of surgery at 2-year follow-up (P=0.48)

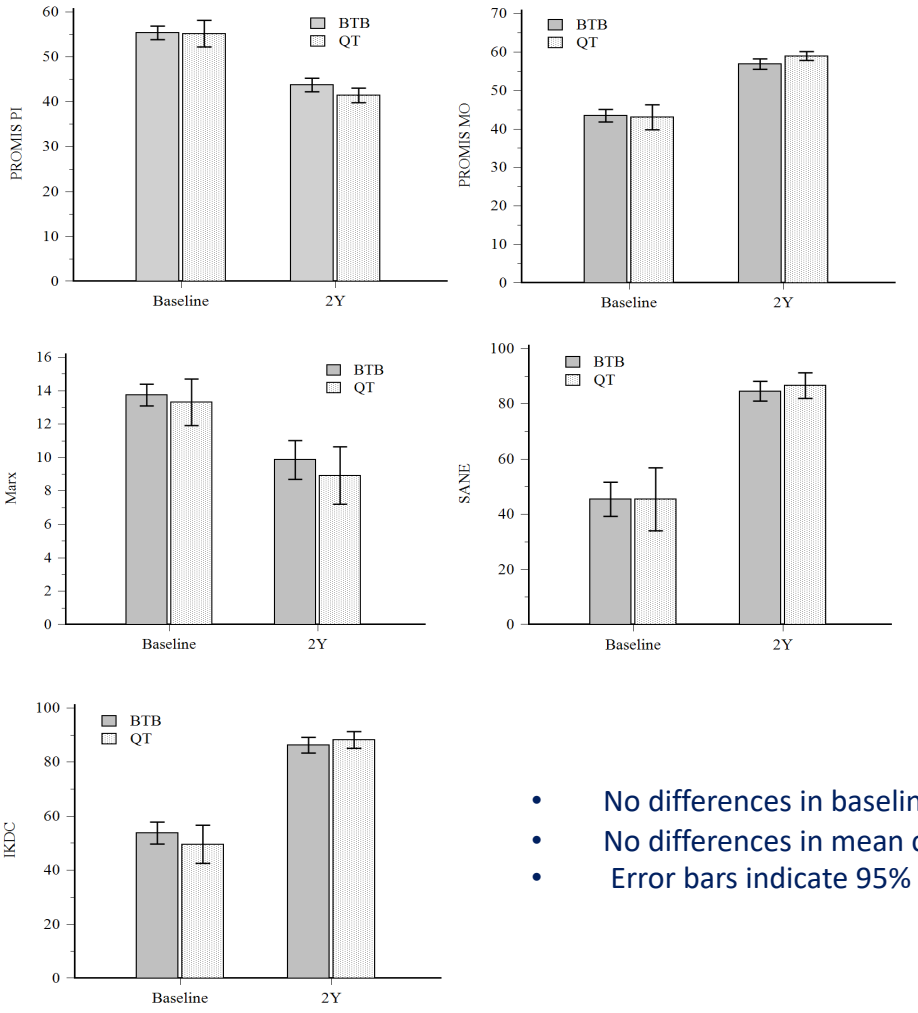
- **Need for an additional surgery was significantly higher in QT patients** (28%) compared to BTBs (13%) (P=0.049) – including both ipsilateral and contralateral surgery
  - There was also a **significant difference in ipsilateral reoperations** in the QT group (26%) compared to the BTB group (10%) (p=0.016)
  - There were **no differences in reoperation for graft failure** between the groups (2% in both)

RESULTS

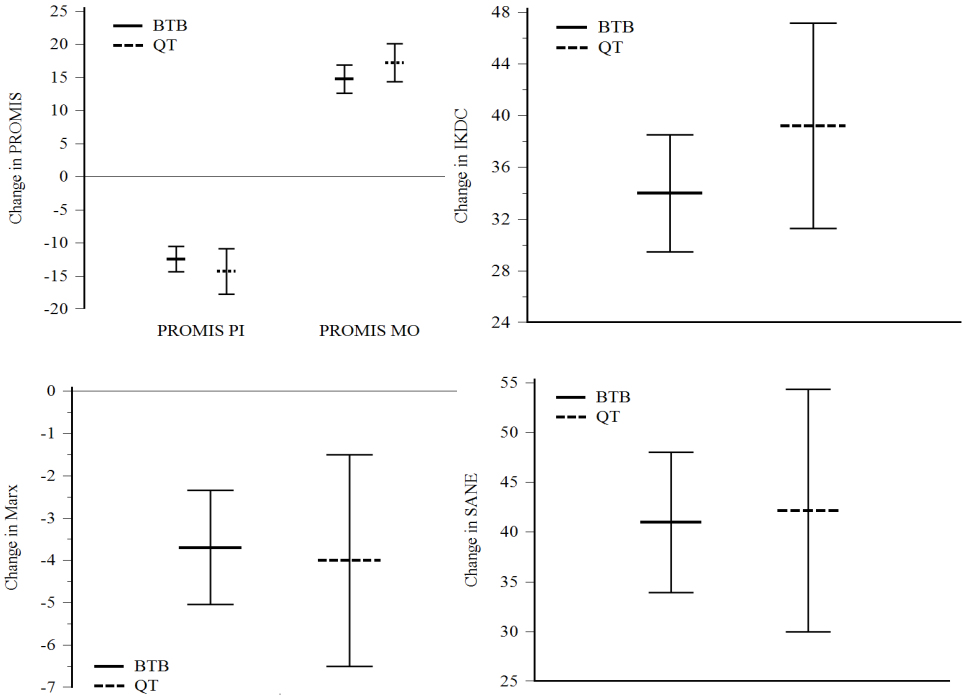
- Re-operations/subsequent ipsilateral surgery within follow up period
  - **QT group: 13 patients (out of 50)**
    - 6 removals of suture/scar tissue
      - 5 suture granuloma removals (Ethibond)/scar revisions
      - 1 suture removal (Ethibond)
    - 1 removal of loose body (subsequent traumatic injury)
    - 2 painful scar tissue (cyclops) debridements
    - 1 lysis of adhesions (stiffness)
    - 1 meniscal repair
    - 1 I&D
    - 1 revision ACLR
  - **BTB group: 9 patients (out of 87)**
    - 2 meniscal repairs
    - 2 meniscectomies
    - 1 cyclops debridement
    - 1 removal of HW
    - 1 I&D
    - 2 revision ACLRs

RESULTS

Baseline and 2-year PROs between BTB and QT groups



Mean Change in PROs between BTB and QT groups



- No differences in baseline or 2-year PRO scores between the BTB and QT groups
- No differences in mean change of PRO scores between groups from baseline to 2-years post-op
- Error bars indicate 95% confidence intervals

LIMITATIONS

- Includes **several younger patients** (as young as 13 in both cohorts) – capturing at least in part a high-risk population
- **Different surgeons** – not all surgeons do both QT ACLR and BTB ACLR procedures with same frequency or with the same techniques
- **Follow-up/compliance rates** were 70% for the QT group and 65% for the BTB group – remaining patients lost to follow-up/unable to reach to answer questions
- Still no information on **long-term outcomes**

DISCUSSION

- **Satisfaction rates were high** in both groups (89% very or somewhat satisfied)
- Return to sport rates for QT and BTB patients were similar at early follow-up with a trend toward higher RTS in QT group (87% vs. 74%, p=0.093) and **higher RTS Experience scores in the QT group** compared to the BTB patients at follow-up (8.4 vs. 4.8, P<0.001)
- There were **no differences in reoperation for graft failure** between the groups
- However, there was a higher re-operation rate in the QT group compared to the BTB group, but nearly half were for non-absorbable suture removal
- These results suggest **comparable functional outcomes, return to sport, and graft failure rates between QT and BTB graft types at early follow-up**, but further investigation into overall reoperation rates is warranted

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