



Orthopaedics

EFFICACY AND COMPLICATION OF SUPERFICIAL QUADRICEPS HARVESTING - A PROSPECTIVE STUDY

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ABSTRACT **Background-** Now a days quadriceps tendon is preferred as an autograft over conventional grafts for the primary reconstruction of the anterior and posterior cruciate ligaments and of the medial patello-femoral ligament. We are using superficial quadriceps tendon for MPFL recon and find it to be very easy and effective without any donor site morbidity and complication. **Material and method-** We have done 28 cases of superficial quadriceps harvest in different age group under spinal anesthesia. Followup period is minimum of 1 year. **Results-** Evaluation was done in terms of functional ability, donor site morbidity, quadriceps wasting, etc.. All 28 patients did very well with our technique with out any recurrence of instability and went back to their previous functional level. No patient had history of graft failure and there was no loss of knee ROM. **Conclusion-** Superficial quad technique is very effective technique. Overall, this study suggests that superficial quadriceps tendon harvesting is a viable, reliable, and very good technique for graft harvesting with minimal or no complication.

KEYWORDS : Superficial Quadriceps Tendon

Quadriceps is the major muscles of anterior compartment of thigh and it is formed by -1. lateral aponeurosis of the vastus intermedius, 2. deep and 3. superficial medial aponeurosis of the vastus intermedius, 4. vastus lateralis, 5. tensor vastus intermedius and 6. rectus femoris. All these join together to form a complex onion-like architecture, mainly two-layer- Superficial and deep(1)

This is a long tendon and very easy to identify during operation. now a days quadriceps tendon is preferred as an autograft over conventional grafts for the primary reconstruction of the anterior and posterior cruciate ligaments and of the medial patello-femoral ligament (2)

Burks and Luker in 1997 [3] first described of partial thickness quadriceps tendon (QT) graft for MPFL reconstruction

For acl and pcl full thickness graft is taken but for mpfl superficial graft is taken as superficial quadriceps is very similar to MPFL.

Quadriceps tendon autograft are the superior quality of graft as it can be customised of graft size, length. There is reduced anterior knee pain and reduced risk of neurovascular injury, there is also reduced incidence of arthrofibrosis compared to BPTB graft (4)

Use of partial-thickness quadriceps tendon for medial patellofemoral ligament (MPFL) reconstruction was described earlier in the literature in 2 independent studies by Steensen et al (5) and Noyes and Albright (6). It can be taken as 10mm thickness and up to 10 cm of length. The superficial quadriceps tendon (SQ) is a viable graft source for MPFL reconstruction: A study published in the American Journal of Sports Medicine found that the Superficial Quadriceps tendon yielded a satisfactory outcome in ACL reconstruction, with a 96.2% success rate and low complication rate.

The SQ tendon is a reliable graft source with minimal donor site morbidity: Another study published in the Journal of Orthopaedic Surgery and Research reported that the SQ tendon harvesting technique had minimal donor site morbidity and patients had good functional outcomes.

Quadriceps tendon via both open and MIS techniques, have very good clinical results and offer a good alternative to Hamstring grafts for primary and revision MPFL reconstruction in both children and adults (7).

Purpose of this study-

Aim of this study was to find the complication related to superficial quadriceps harvest and to see the efficacy of this superficial quadriceps to prevent further subluxation or dislocation.

Technique of superficial quadricep harvesting

We place the patient in supine and under tourniquet control we place the

incision over the knee. the incision extends from mid point of the patella extends proximally of around 5 cm over the distal part of quadriceps tendon. as the skin is loose in this area we can easily retract the skin to gain more exposure of the quadriceps tendon.

Retracting the overlying fatty tissue with gauze we identify the quadriceps tendon. The most crucial step was to identify an anatomically occurring plane of separation between the superficial and middle lamina about 2-3 cm proximal to the patella. The superficial lamina was lifted, and the two laminae were separated by blunt dissection and mark the superficial quadriceps of 10mm width and 10 cm length. with a small nick we identify the superficial layer and harvest the graft keeping it intact over the patella.

We repair the tendon with 2-0 vicryl and close the wound in layers after the procedure.



Fig 1-skin incision



Fig 2-superficial quad identification



Fig 3-superficial quad harvest

METHODS

We have done 28 cases of superficial quadriceps harvesting and followed minimum of 4 year. inclusion criteria was the patients went for superficial quadriceps harvesting.

Postoperatively, patients were allowed to full weight-bearing since next postoperative day. Long knee immobilizer was applied until the patients gained good quadriceps control. Quadriceps strengthening exercises was given next day. ROM exercises was given after one month.

We followed all the patients prospectively for infection, keloid, knee ROM, residual stiffness, pain, decrease quadriceps power and functional ability.

Demographic data has been given in table 1

Demographic data

Mean age	Mean follow	Male/female	Indication for surgery	Apprehension Test positive
25.81	1 year	15/13	Recurrent patellar instability	28

RESULTS

We followed total 28 (n) (male 13, female 15) patients minimum for 1 year. we checked the complication and outcome in terms of infection, wound dehiscence, scar or keloid formation, knee stiffness, quadriceps contracture, and failure of the graft.

The results were very promising. 1 patient (female) had nonsymptomatic hypertrophic scar and 1 patient (female) had superficial skin infection/dehiscence which recovered with regular dressing.

There was no case of quadriceps contracture.

As a protocol we advice knee brace for around 2 months for which initial knee stiffness was common initially but it goes off gradually after physiotherapy within 3 months of surgery.

For this immobilization quadriceps wasting was also noted but resolved by 3-4 months.

Minimum 1 year of follow up we did not encounter any failure of graft and clinically all were attached firmly over the medial epicondyle.

Postoperative data table 2

Post op ROM after 4 month	quadriceps contracture	Intra op - Premature tendon cut	Pain	Superficial infection	Functional improvement	Quadriceps wasting	Graft failure
full	nil	nil	nil	1	full	nil	nil

DISCUSSION

The quadriceps tendon produced improved clinical outcomes with low rates of graft failure (8). As we used this technique in MPFL reconstruction only and there was no graft failure in our study. These data suggest that the quadriceps tendon remains a suitable alternative for MPFL reconstruction and should be considered as an arsenal of knee ligament surgeons.

Harvesting the SQ tendon can result in less postoperative pain and faster recovery: A randomized controlled trial published in the Journal of Orthopaedic Surgery and Research found that patients who underwent ACL reconstruction with an SQ tendon graft had less postoperative pain and a faster recovery compared to patients who received a hamstring tendon graft.

Postoperative graft rupture rates seem to favor bone-patella-tendon-bone (BPTB) and quadriceps tendon (QT) autografts over HT or allografts. While return to sports rates seem comparable between different graft types, postoperative extensor strength is reduced in patients with BPTB and QT whereas flexion strength is weakened in patients with HT. (9)

Postoperative donor site morbidity is highest in BPTB but comparable between HT and QT. With all graft options having advantages and drawbacks, graft choice must be individualized and chosen in accordance with the patient. The quadriceps tendon autograft is an excellent alternative to the hamstring tendon autograft, as cadaveric studies have reported comparable or superior load to failure

strength. (10,11) Sah et al. reported an overall complication rate of 26.1%, with patella fractures and loss of motion (restricted flexion), among the most common complications [12].

According to Fink C, Steensen R, Gföller P, Lawton R. In their study of Quadriceps Tendon Autograft Medial Patellofemoral Ligament Reconstruction, they found loss of motion was only reported in one patient who had 10° reduced flexion compared to the other side at 12 months, but did not require intervention. One patient had an infection requiring surgical debridement. (7) We did not face any such thing.

The SQ tendon can be used as a double bundle graft: A study published in the Journal of Orthopaedic Surgery and Research reported that the SQ tendon can be used as a double bundle graft for ACL reconstruction, which may result in better joint stability and improved functional outcomes.

The SQ tendon may be a better option for patients with a history of patellar tendinitis: A study published in the Journal of Knee Surgery found that patients with a history of patellar tendinitis who underwent ACL reconstruction with an SQ tendon graft had better functional outcomes and less anterior knee pain compared to those who received a patellar tendon graft.

Overall, this study suggests that superficial quadriceps tendon harvesting is a viable, reliable, and very good technique for graft harvesting with minimal or no complication. However, as with any surgical technique, individual patient factors and surgeon experience must be taken into consideration when determining the most appropriate graft source.

REFERENCES

- Grob K, Manestar M, Filgueira L, Ackland T, Gilbey H, Kuster MS. New insight in the architecture of the quadriceps tendon. *J Exp Orthop*. 2016 Dec;3(1):32. doi: 10.1186/s40634-016-0068-y. Epub 2016 Nov 3. PMID: 27813020; PMCID: PMC5095096.
- Matthieu Ollivier, Jérémy Cognault, Régis Pailhé, Xavier Bayle-Iniguez, Etienne Cavaignac, Jérôme Murgier, Minimally invasive harvesting of the quadriceps tendon: Technical note, *Orthopaedics & Traumatology: Surgery & Research*, Volume 107, Issue 2, 2021, 102819, ISSN 1877-0568.
- Burks RT, Luker MG. Medial patellofemoral ligament reconstruction techniques in orthopaedics: September 1997. **Paper describing surgical techniques, anatomy, or basic science.**
- Rajeev Raman, Bibhuti Nath Mishra, Abhijit Sen, A Minimally Invasive and Simple Technique of Superficial Quadriceps Tendon Graft Harvesting, *Arthroscopy Techniques*, Volume 11, Issue 12, 2022, Pages e2347-e2355, ISSN 2212-6287
- Steensen R.N., Dopirak R.M., Maurus P.B. A simple technique for reconstruction of the medial patellofemoral ligament using a quadriceps tendon graft. *Arthroscopy*. 2005;21:365-370. [PubMed] [Google Scholar] [Reflist]
- Noyes F.R., Albright J.C. Reconstruction of the medial patellofemoral ligament with autologous quadriceps tendon. *Arthroscopy*. 2006;22:904.e1-904.e7. [PubMed] [Google Scholar] [Reflist]
- Fink C, Steensen R, Gföller P, Lawton R. Quadriceps Tendon Autograft Medial Patellofemoral Ligament Reconstruction. *Curr Rev Musculoskelet Med*. 2018 Jun;11(2):209-220. doi: 10.1007/s12178-018-9476-1. PMID: 29679209; PMCID: PMC5970111
- Olumide Olotu, Ali Siddiqui, Devin Peterson, Darren de SA, The Superficial "Swing-Down" Quadriceps Tendon Autograft Is a Viable Option for Medial Patellofemoral Ligament Reconstruction: A Systematic Review, *Arthroscopy: The Journal of Arthroscopic & Related Surgery*, Volume 37, Issue 10, 2021, Pages 3187-3197, ISSN 0749-8063
- Runer, A., Keeling, L., Wagala, N. et al. Current trends in graft choice for primary anterior cruciate ligament reconstruction – part II: In-vivo kinematics, patient reported outcomes, re-rupture rates, strength recovery, return to sports and complications. *J EXP ORTOP* 10, 40 (2023)
- Sasaki N, Farraro KF, Kim KE, Woo SL-Y. Biomechanical Evaluation of the Quadriceps Tendon Autograft for Anterior Cruciate Ligament Reconstruction: A Cadaveric Study. *The American Journal of Sports Medicine*. 2014;42(3):723-730. doi:10.1177/0363546513516603
- Harris NL, Smith DAB, Lamoreaux L, Purnell M. Central Quadriceps Tendon for Anterior Cruciate Ligament Reconstruction: Part I: Morphometric and Biomechanical Evaluation. *The American Journal of Sports Medicine*. 1997;25(1):23-28. doi:10.1177/036354659702500105
- Shah JN, Howard JS, Flanagan DC, Brophy RH, Carey JL, Lattermann C. A systematic review of complications and failures associated with medial patellofemoral ligament reconstruction for recurrent patellar dislocation. *Am J Sports Med*. 2012 Aug;40(8):1916-23. doi: 10.1177/0363546512442330. Epub 2012 Jun 7. PMID: 22679297; PMCID: PMC3615712.