HYDRODISSECTION- A NEW TECHNIQUE OF HAMSTRING GRAFT HARVESTING

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ABSTRACT

BACKGROUND

Harvesting of hamstring tendon is a very important step in anterior cruciate ligament (ACL) reconstruction. Many techniques of hamstring graft harvest have been reported. There are many disadvantages of using the traditional technique for hamstring tendon harvesting. Here we have used a new and easy technique to avoid the disadvantages and allow for easy and perfect hamstring tendon graft harvesting which is also reproducible as the medial structures of the tibia have a consistent anatomic pattern and offers protection to saphenous nerve and superficial medial collateral ligament.

METHODS

We carried out arthroscopic ACL reconstruction using hamstring tendons auto graft on 70 patients with knee ligament injuries with instability using a new technique for hamstring tendons harvesting.

RESULTS

Subjective assessment was done according to International Knee Documentation Committee rating system. This was defined as four grades as follows: Normal (A), Nearly Normal (B), Abnormal (C), and Severely Abnormal (D). Before ACL injury, 70 (100%) patients considered their knees to have been grade A. Twenty-four months after reconstruction, 68 patients rated their knees as normal or nearly normal. Two patients rated their knee as abnormal at 2 years of follow-up. These patients had severe osteoarthritic changes.

CONCLUSIONS

The technique of hydrodissection is a simple and fast technique to aid in identification, isolation and indirect separation of hamstring tendons with small incision used as grafts in knee surgeries at no extra cost to the patient.

KEYWORDS

Anterior Cruciate Ligament, Cruciate Ligament Reconstruction, Hamstring Tendon Grafting.

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BACKGROUND

Anterior cruciate ligament injuries are one of the most common sports knee injuries[1] encountered in orthopaedic practice, though rarely isolated but more commonly with other ligaments or menisci injuries. Management as such is individualised with a high percentage of them requiring surgery. Anterior cruciate ligament (ACL) reconstruction is aimed at restoring the functional stability in both rotational and anteroposterior translational plane, allowing for patients to return to their sports activity at the earliest.

The available choices of graft are hamstring tendons, Patella tendon bone, allograft, synthetic graft each with their own pros and cons. Patellar tendon being subcutaneous in nature are easier to harvest[2,3] associated with post-operative anterior knee pain. Hamstring tendons as graft have been in vogue since Lipscombe in 1982 and arthroscopically 4 strand grafts by Friedman in 1988[4] and are the most commonly used grafts in current practice.[5] The technique of harvest has varied in previous reports; most authors identified the tendons at their musculotendinous junction in the thigh and then proceeded to free the grafts in a proximal-to-distal direction.[6] Current technical advances of harvesting favour the isolation of Hamstring tendons from a distal-to-proximal direction, using an anteromedial incision over the proximal tibia. This same incision may be used for subsequent intraarticular placement of the graft.[6]

Harvesting difficulties of hamstring tendons has been a daunting experience to surgeons worldwide. The main problems faced are in identification and isolating the tendons as they are concealed beneath several tissue layers and in premature tendon amputation during tendon stripping.[2] The purpose of this discussion is to describe a surgical technique that is simple to perform and does not require any additional equipment or training, which can make harvesting of hamstring graft easier, quicker and reproducible.

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METHODS

70 patients with knee ligament injuries with instability who required harvesting of hamstring graft were subjected to the

technique of Hydro dissection. The average time taken for graft harvest was 8:45 seconds. Calculated from the start of injection of saline to the stripping of hamstring graft.

Technique of Hydro Dissection

Pes insertion was palpated and marked. About 10-15 mL normal saline was injected into the anserine bursa by adjusting the needle so that there was free flow of saline. (Figure 1a) Injection was given in a similar fashion as it is given for anserine bursitis.[7] Saline can be observed tracking along the course of the hamstrings, proximally. (Figure 1b). vertical Incision was made over the antero medial aspect of proximal tibia 1 inch below and medial to tibial tuberosity. The Sartorius fascia (layer I) was incised carefully along the course of the gracilis and semitendinosus with a 11-number surgical knife. The integrity of layer I was preserved, to bury the graft fixation device on the tibia.

The leg was placed in a figure-of-four position. The hamstrings tendons were seen standing separated out due to the effect of saline (Figure 2). The gracilis was isolated first using a right-angled artery forceps and an infant feeding tube, as it is more cylindrical followed by semitendinosus tendon (Figure 3). Its close adherence to bone and the direction of fibres[5] are ways of distinguishing the MCL from the tendons. Saline inflation delineates the converging attachment of gracilis and semitendinosus from the underlying MCL. The tendons were stripped one at a time using a stripper from distal to proximal direction and then detached distally from bone using 11 number surgical knives. While harvesting the tendons, placing the leg in the figure-of-four position maximally decreases tension on the saphenous nerve, thereby decreasing the risk of damage.[8] Hydro dissection is another way of moving the nerve out of the way.

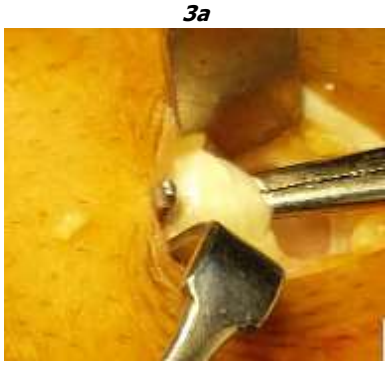
1a

1b

Figure 1a) Injecting 10 ml of Saline into The Anserine Bursa. b) Elevation of The Anserine Bursa After Saline Injection

Figure 2. Semitendinosus Tendon Standing Out After Incision of Sartorius Fascia

3a



3b

Figure 3. a) Isolation of Gracilis Tendon with Right Angled Artery Forceps. b) Isolation of Semitendinosus Tendon with Right Angled Artery Forceps

RESULTS

Subjective assessment was done according to International knee Documentation Committee rating system. This was defined as four grades as follows: normal (a), nearly normal (b), abnormal (c), and severely abnormal (d). Before ACL injury, 70 (100%) patients considered their knees to have been grade A. Twenty-four months after reconstruction, 68 patients rated their knees as normal or nearly normal. Two patients rated his knee as abnormal at 2 years of follow-up. These patients had severe osteoarthritic changes.

DISCUSSION

One of the more difficult aspects of arthroscopic assisted ACL reconstruction involves harvesting the hamstring tendons, this process has proved to be a daunting experience to many surgeons, who prefer patellar tendon bone grafts.[3] Over the recent years there has been an increasing use of hamstring graft. The difficulties faced are that of identification, isolation and premature tendon amputation.[2]

Understanding the basic anatomy on the anteromedial aspect of the proximal tibia is the key to accurate harvesting.[2,9] Gracilis, semitendinosus and Sartorius tendons insert to the anteromedial aspect of the tibia to form pes anserina 19mm (10-25 mm) distal and 22.5 mm (13-30 mm) medial to the apex of the tibial tuberosity.[5,6] Gracilis and semitendinosus are adherent to the deeper side of Sartorius fascia (layer I), gracilis tendon being more proximal and is palpated as it courses from the posterior medial edge of the tibia. Incise the Sartorius fascia and create a plane between it and superficial medial collateral ligament (layer II) to isolate the tendons separately. Superficial medial collateral ligament had one femoral and two separate tibial attachments. Between these two distinct tibial attachments, the superficial medial collateral ligament is separated from the tibia by the inferior medial genicular artery and vein, along with its corresponding nerve branch from the tibial nerve. The proximal attachment of the superficial medial collateral ligament was primarily to soft tissues rather than directly to bone. The majority of the distal attachment is located within the pes anserine bursa and form a large portion of the posterior floor of this bursa.[10] Careful dissection and understanding of anatomy helps in differentiating it from a hamstring tendon. Extreme caution must be used not to damage the underlying gracilis and semitendinosus tendons, and equally important, the superficial medial collateral ligament (layer II). Tendons have a conjoined insertion site which is medial and distal to the tibial tubercle. They become distinct structures at a point that is farther medial and slightly proximal. Tendon harvest is facilitated by identifying the tendons proximal to this point. Apart from the main hamstring tendon insertion to the pes anserinus there may be accessory tendon insertions, particularly for semitendinosus. In addition, there are variable numbers of thick fascial bands that pass between semitendinosus and gracilis and also from these hamstring tendons to gastrocnemius, popliteal, pre-tibial and superficial fascia.[11] Recognising these accessory insertions and fascial bands and dividing them is essential. If these are not recognised and divided it leads to premature tendon amputation and short graft. Cadaveric studies by Candal-Couto and Deehan[11] and Tuncay et al[12] reported the existence of several accessory bands of gracilis and semitendenosus. Tuncay et al[12] studied the anatomy of the fascial bands between semitendinosus and gastrocnemius in 23 cadaveric knees.

The saphenous nerve crosses superficial to the gracilis tendon at the posteromedial joint line. Figure-of-four position and hydrodissection can act in tandem to protect the nerve. Damage to this nerve can present with complaints of paraesthesia in the anteromedial area of the lower leg and medial-sided knee tenderness, and also it has been associated with the development of reflex sympathetic dystrophy.[13]

This anatomy can be made more vigilant by the technique of hydro dissection which makes use of the presence of a tight Sartorius fascia. Saline injected at the anserine bursa distributes between and below the tendons allowing them to stand out independently. The vincula bands and alternate tendinous insertions are more easily identified.

CONCLUSIONS

It is advisable to follow this technique of graft harvesting for all individuals undergoing arthroscopic ACL reconstruction using hamstring tendons to avoid the problems encountered with the standard technique and also to achieve an excellent outcome. The technique of hydrodissection is a simple and fast technique to aid in identification, isolation and indirect separation of hamstring tendons with small incision used as grafts in knee surgeries at no extra cost to the patient. The drawback of this study is that there are no studies to compare the time taken for harvesting hamstring grafts by regular surgical methods.

REFERENCES

[1] Sasibhushana Rao S, Chiranjeevi V, David Raju S. Functional outcome of arthroscopically assisted anterior cruciate ligament reconstruction. IOSR-JDMS 2014;13(10):63-66.
[2] Howell SM. Autogenous graft choices in ACL reconstruction. Current Option in Orthopaedics 2001;12(2):149-155.
[3] Grana WA. Pearls and pitfalls of hamstring graft harvest. Techniques in Orthopaedics 1998;13(4):337-340.
[4] Shaerf DA. Anterior cruciate ligament reconstruction best practice: a review of graft choice. World J Orthop 2014;5(1):23-29.
[5] Charalambous CP, Kwaees TA. Anatomical considerations in hamstring tendon harvesting for anterior cruciate ligament reconstruction. Muscles, Ligaments and tendons J 2012;2(4):253-257.
[6] Pagnani MJ, Warner JJ, O'Brien SJ, et al. Anatomic consideration in harvesting the semitendinosus and gracilis tendons and a technique of harvest. Am J Sports Med 1993;21(4):565-571.
[7] Forbes JR, Helms CA, Janzen DL. Acute pes anserine bursitis: MR imaging. Radiology 1995;194(2):525-527.
[8] Boon JM, Van Wyk MJ, Jordaan D. A safe area and angle for harvesting autogenous tendons for anterior cruciate ligament reconstruction. Surg Radiol Anat 2004;26(3):167-171.
[9] Prodromos CC, Fu FH, Howell SM, et al. Controversies in soft-tissue anterior cruciate ligament reconstruction: grafts, bundles, tunnels, fixation, and harvest. J Am Acad Orthop Surg 2008;16(7):376-384.
[10] Solman CG, Pagnani MJ. Hamstring tendon harvesting. Reviewing anatomic relationships and avoiding pitfalls. Orthop Clin N Am 2003;34(1):1-8.
[11] Candal-Couto JJ, Deehan DJ. The accessory bands of Gracilis and Semitendinosus: an anatomical study. Knee 2003;10(4):325-328.
[12] Tuncay I, Kucuker H, Uzun I, et al. The fascial band from semitendinosus to gastrocnemius: the critical

point of hamstring harvesting: an anatomical study of 23 cadavers. Acta Orthop 2007;78(3):361-363.
[13] Bertram C, Porsch M, Hackenbroch MH, et al. Saphenous neuralgia after arthroscopically assisted anterior cruciate ligament reconstruction with a semitendinosus and gracilis tendon graft. Arthroscopy 2000;16(7):763-766.