

## Functional outcome of Arthroscopic reconstruction of single bundle anterior cruciate ligament using 5 strand hamstring graft.

Dr. Nitin Wagh<sup>1</sup>, Dr. Sandeep Pangvane<sup>1</sup>, Dr. Parth Agrawal<sup>1</sup>, Dr. Utkarsh Pawar<sup>1</sup>.

<sup>1</sup>(Department of orthopaedics, Dr. Vasant Rao Pawar Medical College & Research Center, Maharashtra University of Health Sciences, Nashik, Maharashtra, India)

---

**Abstract:** Four-strand hamstring autograft is a common choice for anterior cruciate ligament (ACL) reconstruction. Advocates for its use cite a decreased potential for catastrophic extensor mechanism complications and a decreased incidence of anterior knee pain associated with central-third bone patellar tendon bone (BPTB) autograft. In addition, biomechanical testing of 4-strand gracilis and semitendinosus autograft has shown a higher load to failure than that with BPTB autograft. Most importantly, clinical outcomes have been equivalent using 4-strand hamstring autograft and using BPTB autograft.

A potential disadvantage of hamstring autograft for ACL reconstruction is the inherent variability in graft diameter. Biomechanical testing has shown a correlation between graft cross-sectional area and maximum load to failure. Historically, authors have recommended the use of grafts at least 7 mm in diameter, although limited evidence supports this recommendation.

We have hypothesized that a stronger, stiffer five-strand HS graft using three strand Semitendinosus/two-strand-Gracilis, would result in higher stability rates than 4HS using two strand-Semitendinosus/two-strand-Gracilis.

**Materials & Methods:** 40 Patients having ACL injury were treated at a tertiary care hospital; using a 5 strand hamstring graft, endobutton and RCI screws. Cases were diagnosed ACL on clinical examination & MRI.

Tegnerlyshom score was used post-operatively to grade the functional outcome of an ACL reconstruction.

**Results:** 30 patients had excellent outcome, 7 persons had good outcome and 3 persons had fair outcome graded according to Tegnerlyshom score.

**Keywords:** ACL, 5 Strand, graft diameter, tunnel size.

---

### I. "Introduction":-

Now a days, because of increase awareness regarding sports in young individuals and recent advances in diagnostic and treatment modalities ACL injuries are being easily diagnosed and treated. The Anterior cruciate ligament prevents anterior translation of tibia over femur and has definite role in providing rotatory stability of the knee. Kinematics of the knee joint is disturbed in ACL deficient knee. The disturbed biomechanics lead to damage to the other structures of the knee joint like the articular cartilage and leads to early arthritic changes in the knee joint.

Even in the highest stability four-strand hamstring (4HS) ACL reconstruction series side-to-side differences of >2mm are generally seen in at least a third of all knees.

Historically, authors have recommended the use of grafts at least 7 mm in diameter, although limited evidence supports this recommendation.

Cadaveric analysis has shown a linear correlation between maximum load to failure and graft cross-sectional area. These laboratory data have been confirmed clinically, with Magnusson et al.<sup>[1]</sup> reporting increased revision rates for smaller-diameter grafts.

Hamner DL<sup>[2]</sup> et al. showed that equally tensioned four-strand hamstring-tendon grafts have initial tensile properties that are higher than those reported for ten-millimeter patellar-ligament grafts; thus, from a biomechanical point of view, they seem to be a reasonable alternative and because of donor site morbidity associated with BTB graft hamstring grafts have become popular.

### II. "Materials & Methods":-

40 Patients were treated using 5 stranded hamstring graft.

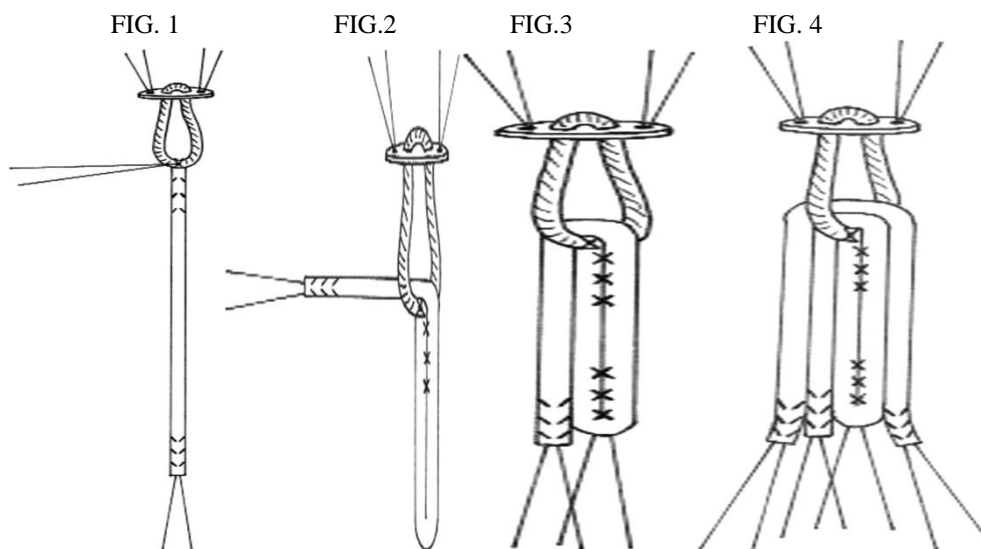
Functional outcomes graded according to the TegnerLysholmscoring system. The present study was done to evaluate the functional outcome following Anterior cruciate ligament reconstruction using 5 stranded hamstring graft. The study was a prospective study from period January 2015 to September 2015.

### III. “Surgical Technique”:-

First, one end of the semitendinosus tendon is tied to the EndoButton loop using the free tails from its running, locking stitch (Fig 1). These suture tails are left intact because they will be used later to suture 2 of the semitendinosus strands together.

The opposite, free end of the semitendinosus is then brought through the EndoButton loop to create 3 equal-length tendon strands (FIG. 2).

The preserved suture limbs previously used to secure the end of semitendinosus to the EndoButton loop are used to secure the 2 graft strands connected by a tendon loop distally away from the EndoButton (FIG.3). The gracilis tendon is brought through the EndoButton loop, bisecting this in standard fashion, and the 5-strand graft is completed (FIG.4).



### IV. “Results”:-

40 Patients were evaluated from period 2015 to September 2015. Patient were in age group of 20 yrs - 36 yrs. 15 persons were in age group of 24-28 yrs of age. 9 patients were female and 31 were male. 37% of person had sports injury. Graft size of 9mm was maximum in 27 persons, 10 mm was in 9 persons, 8 mm was in 4 persons. 85% of people had return to preinjury level & 15% of people had return upto some extent. Tegnerlysholm score grading Post-op 6 months showed excellent results in 30 people, Good in 7 people & Fair in 3 people.  $P < 0.001$  shows highly significant difference between Pre and Post Op TegnerLysholmscores after 6 months.

TABLE NO :- 1

**Age group wise Distribution**

| Age Group | Frequency | Percentage |
|-----------|-----------|------------|
| 20-24     | 13        | 32.50%     |
| 24-28     | 15        | 37.50%     |
| 28-32     | 8         | 20.00%     |
| 32-36     | 4         | 10.00%     |
| Total     | 40        | 100.00%    |

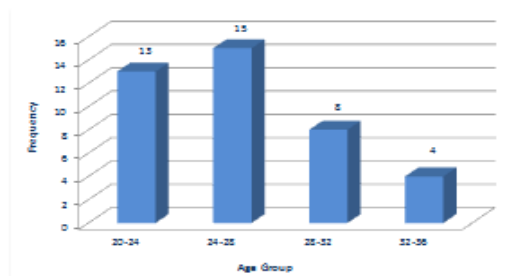


TABLE NO:-2

**Graft size**

| Graft Size (mm) | Frequency | Percentage |
|-----------------|-----------|------------|
| 8 mm            | 4         | 10.00%     |
| 9 mm            | 27        | 67.50%     |
| 10 mm           | 9         | 22.50%     |
| Total           | 40        | 100.00%    |

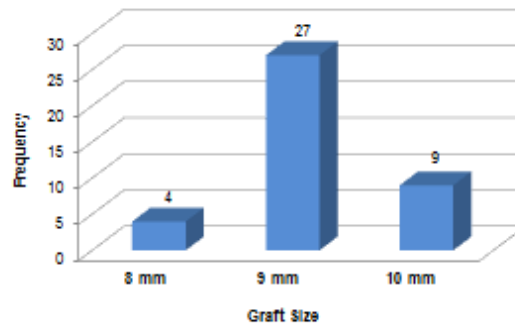


TABLE NO:-3

**Status of return to pre injury level**

| Status of return to pre injury level | Frequency | Percentage |
|--------------------------------------|-----------|------------|
| Up to some extent                    | 6         | 15.00%     |
| Yes                                  | 34        | 85.00%     |
| Total                                | 40        | 100.00%    |

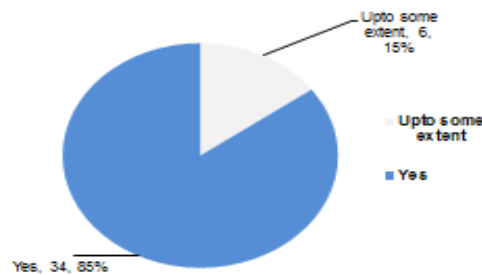
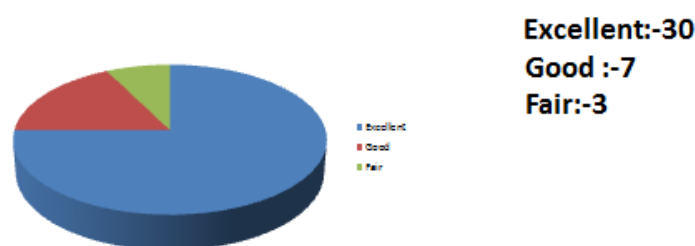


TABLE NO:-4

### TEGNER LYSHOLM SCORE GRADING POST-OP



#### V. Conclusion

The 3ST/2Gr five-strand graft offers very high strength and more length than the 4ST. It is useful in patients with ligamentous laxity, small tendons, or other stability risk factors. Regarding minimum graft tunnel length: 15 mm of graft would appear to be all that is necessary in the tunnels for adequate healing. Gracilis harvest does not disable two hamstrings because Gr is not a hamstring but rather is an adductor, both anatomically and functionally.

Magnussen et al. recently evaluated hamstring autograft diameter as a predictor for graft failure and the need for revision. In a study of 256 patients with hamstring autograft ACL reconstruction, 7.0% required revision at a mean of 14 months' follow-up. Decreased graft diameter and age were shown to be associated with increased revision rates. Grafts greater than 8 mm in diameter had a revision rate of 1.7%, 7.5- to 8-mm grafts had a revision rate of 6.5%, and grafts of 7 mm or less had a revision rate of 13.6%. When grafts of 8 mm or less were used in patients aged younger than 20 years, the revision rate rose to 16.5%.

Using a 5 strand hamstring graft by creating 3 equal strand of semitendinous and double of gracilis gives a increase in diameter >2 mm in our study maximum to 9mm diameter which leads to stronger graft and it decreases revision rates

#### References

##### Journal Papers:-

- [1] Graft Size and Patient Age Are Predictors of Early Revision After Anterior Cruciate Ligament Reconstruction With Hamstring Autograft Robert A. Magnussen, M.D., J. Todd R. Lawrence, M.D., Ph.D., Ryenn L. West, B.S., Alison P. Toth, M.D., Dean C. Taylor, M.D., William E. Garrett, M.D., Ph.D. *J. Arthro.* 2011.11.24.
- [2] Hamstring Tendon Grafts for Reconstruction of the Anterior Cruciate Ligament: Biomechanical Evaluation of the Use of Multiple Strands and Tensioning Techniques \*DYSON L. HAMNER, M.D.; CHARLES H. BROWN, JR., M.D.; MARK E. STEINER, M.D.; AARON T. HECKER, M.S.; WILSON C. HAYES, PH.D., BOSTON, MASSACHUSETTS *J Bone Joint Surg Am*, 1999 Apr; 81 (4): 549 -57 .
- [3] Five-Strand Hamstring Autograft for Anterior Cruciate Ligament Reconstruction Kyle P. Lavery, M.D., Jeffrey F. Rasmussen, M.D., and AmanDhawan, M.D. *Arthroscopy Association of North America* 2212-6287/13691.
- [4] Wilson TW, Zafuta MP, Zobitz M. A biomechanical analysis of matched bone-patellar tendon-bone and double-looped semitendinosus and gracilis tendon grafts. *Am J Sports Med* 1999;27:202-207.
- [5] Sajovic M, Strahovnik A, Demovsek MZ, Skaza K. Quality of life and clinical outcome comparison of semitendinosus and gracilis tendon versus patellar tendon autografts for anterior cruciate ligament reconstruction: An 11-year follow-up of a randomized controlled trial. *Am J Sports Med* 2011;39:2161-2169.
- [6] Maeda A, Shino K, Horibe S, Nakata K, Buccafusca G. Anterior cruciate ligament reconstruction with multistranded autogenous semitendinosus tendon. *Am J Sports Med* 1996;24:504-509.
- [7] Bickel BA, Fowler TT, Mowbray JG, Adler B, Klingele K, Phillips G. Preoperative magnetic resonance imaging cross-sectional area for the measurement of hamstring autograft diameter for reconstruction of the adolescent anterior cruciate ligament. *Arthroscopy* 2008;24:1336-1341.
- [8] Treme G, Diduch DR, Billante MJ, Miller MD, Hart JM. Hamstring graft size prediction: A prospective clinical evaluation. *Am J Sports Med* 2008;36:2204-2209.
- [9] Williams RJ III, Hyman J, Petrigliano F, Rozental T, Wickiewicz TL. Anterior cruciate ligament reconstruction with a four-strand hamstring tendon autograft. Surgical technique. *J Bone Joint Surg Am* 2005;87: 51-66.