



ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION USING REMNANT PRESERVATION: CLINICAL AND FUNCTIONAL RESULTS.

ORTHOPAEDICS

Dr. Anil Prakash	Professor & Hod , Department Of Orthopaedics, Namo Medical Education & Research Institute, Shri Vinoba Bhav Civil Hospital, Silvassa, Dadra And Nagar Haveli UT
Dr Dheeraj L. Bhoi*	Senior Resident, Department Of Orthopaedics, Namo Medical Education & Research Institute, Shri Vinova Bhav Civil Hospital, Silvassa, Dadra And Nagar Haveli UT. *Corresponding Author
Dr Vijay Munde	Junior Resident ,department Of Orthopaedics, Namo Medical Education & Research Institute, Shri Vinoba Bhav Civil Hospital, Silvassa, Dadra And Nagar Haveli UT.

ABSTRACT

Introduction: The Goal Of This Study Was To Examine The Clinical And Functional Outcomes Of Anterior Cruciate Ligament (acl) Replacement With Autogenous Hamstring Tendon Using Remnant Preservation. The Preservation Of Acl Remnant Tissue May Considerably Reduce The Degree And Incidence Of Tunnel Enlargement After Anatomic Double-bundle Acl Restoration, Although The Remnant-preserving Method May Not Significantly Increase The Risk Of Tunnel Coalition After Surgery. **Objective:** To Evaluate Clinical & Functional Results After Aclr (anterior Cruciate Ligament Reconstruction) With Native Remnant Of Torn Acl **Method:** A Prospective Trial Was Conducted On 70 Consecutive Patients Who Underwent Aclr With The Remnant Preservation Approach. Preoperatively And At The Final Follow-up, The Lysholm Score, International Knee Documentation Committee (ikdc) Grade, Stability Assessments (lachman Test, Pivot-shift Test) **Results:** After The Procedure, The Clinical Scores Improved. Lachman Tests, Pivot-shift Tests, And Hss Score Differed Statistically Significantly Before And After Surgery.

KEYWORDS

ACLr(anterior Cruciate Ligament Reconstruction), Remnant, Arthroscopy.

INTRODUCTION

The Anterior Cruciate Ligament (acl) Is One Of The Most Frequently Sustained Injuries In Sports. Reconstruction Of The Acl Is Commonly Done To Restore Knee Functions, Stop Additional Intra-articular Damage Like Meniscus Injuries, And Slow The Progression Of Osteoarthritis (oa) In The Knee.(1,2)

Reconstruction Of The Anterior Cruciate Ligament (acl) Can Have Varying Results.(3,4) Recently Several Studies Have Shown That A Successful Acl Reconstruction May Depend Not Only On The Mechanical Stability But Also On The Biological Healing Or Recovery Of Proprioception (5,6) According To Certain Reports, Proprioceptive And Functional Outcomes Were Improved When Acl Reconstruction Was Done Using The Remnant Preserving Technique. (7,8,9) Few Studies Have Assessed The Variations In Clinical Outcomes And Graft Morphology Based On The Amount Of Preserved Remnant In Acl Reconstruction Using A Hamstring Autograft, Despite The Fact That Some Have Reported Second-look Arthroscopic Findings Following Acl Reconstruction. (10,11)

The Aim Of This Study Was To Analyse The Outcomes The And Complications Of Standard Double-bundle Reconstruction For Knees Without A Usable Remnant During The Same Time Period With Those Of Double-bundle Hamstring Acl Reconstruction With Remnant Preservation. Our Hypothesis Was That Preserving The Remnants Would Improve Graft Healing While Raising The Risk Of Problems Brought On By Excessive Tissue Growth.

Aim

To Evaluate Clinical & Functional Outcomes Of Acl Reconstruction With Remnant Preservation.

MATERIALS & METHOD

A Prospective Observational Study Was Carried Out At The Department Of Orthopaedics Vinoba Bhav Civil Hospital, Silvassa. Informed Consent Was Obtained From The Patients As Well As Approval From The Hospitals Ethical Committee.

75 Patients With Acl Tear Were Treated With Acl Reconstruction With Remnant Preservation In Our Study. Duration Of Study Was For 2 Years.

Inclusion Criteria

1. A Complete Acl Tear.
2. The Acl Remnant's Tibial Insertion Was Completely Intact; And
3. Arthroscopy Confirmed That The Remnant's Length And Diameter Were Perfectly Adequate, As It Can Be Pulled To Reach

The Femoral Acl Insertion And Its Diameter Expected To Exceed Half Of The Native Acl.

Exclusion Criteria

1. Acl Injuries In Both Knees;
2. Simultaneous Injuries To The Posterior Cruciate Ligament (pcl), Posterolateral Corner (plc), Or Grade Iii Medial Collateral Ligament (mcl);
3. complete Meniscectomy; And
4. A History Of Knee Surgery

Treatment Protocol

As Usual, Arthroscopic Examinations And Portal Formation (superolateral, Anteromedial [am], And Anterolateral Portals) Were Conducted Out. Using A Spinal Needle To Determine The Correct Position, An Accessory Am Portal Was Made 1 Cm Medial To The Standard Am Portal. Graft Harvest And Preparation Were Carried Out For The 4-strand Single-bundle Aclr. The Guide's Intraarticular Starting Point Was Positioned In The Centre Of The Identified Tibial Footprint. To Allow For Oblique Orientation, The External Starting Point Was Always Placed At The Anterior Border Of The Medial Collateral Ligament's Insertional Fibres. The Femoral Tunnel Was Drilled In The Femoral Notch At 10 O'clock (right Knee) Or 2 O'clock (left Knee) Using A Transtibial Technique, Intermediate Between The Anteromedial And Posterolateral Attachments. In Some Cases, Notchplasty Was Not Performed. The Graft Was Placed Through The Remnant, Displacing The Remainder Of The Acl Stump Laterally. The Remnant The Acl Fibre Was Inserted Laterally To The Graft, Directing The Insertion Of The Pl Bundle. The Remnant The Acl Fibre Was Inserted Laterally To The Graft, Directing The Insertion Of The Pl Bundle. Ahn Et Al. Described The Remnant Suture And Tension Technique. (12) First, Three No. 2-0 Pds Sutures Were Positioned In The Proximal Part Of Remnant, And The Loose Ends Of The Sutures Were Pulled Out By The Am Portal. The Traction Sutures Of The Remnant Were Passed By The Am Femoral Tunnel Following The Passage Of The Am Bundle Graft. As Tension Was Applied To The Remnant, The Traction Suture Was Pulled Through The Femoral Bone Tunnel And Secured Over The Endo-button.

The Endobutton And Bio-cross Pin (mitek, Johnson & Johnson, Massachusetts, Usa) Were Used To Fix The Femoral Tunnel. The Tibial Tunnel Was Initially Secured With Bioabsorbable (polylactic Acid) Interference Screws (biocri, Smith & Nephew, Uk), And Then The Remaining Tendon Portion Was Further Fixed With A Staple Or Post Tie To Add Tibial Side Fixation Stability. We Assessed Whether The Remaining Ligament Impinged On The Intercondylar Notch Or Not.

Post Operative Rehabilitation

The Operated-on Knee Was Immobilized In Extension For A Week Following Surgery. One Week Into The Physio , Range Of Motion Exercises Began. Partial Weight-bearing Was Permitted For One Week, Followed By Full Weight-bearing After Three Weeks. Jogging Was Started At Four Months, And Full Returning To Rigorous Activity Was Allowed Between Nine And Twelve Months.

The Data On Categorical Variables Are Presented As The Number Of Patients And The Data On Continuous Variables Are Presented As Mean And Standard Deviation (sd). The Statistical Significance Of Pair-wise Difference Of The Mean Of Continuous Variables Was Tested Using Wilcoxon Signed Rank Test And That Of One Sample Distribution Was Tested Using One Sample Chi-square Test For Majority. A P-value Less Than 0.05 Was Considered Statistically Significant. All The Hypothesis Were Formulated Using Two Tailed Alternatives Against Each Null Hypothesis (hypothesis Of No Difference). The Entire Data Were Statistically Analysed Using Spss Software.

Results

Table 1. The Distribution Of General Characteristics Of The Patients Operated (n = 70)T

Age	No. Of Patients
<25	1
25-34	26
35-44	32
45-54	11

Sex

Male	45
Female	25

Mode Of Injury

Sport Activity	55
Twisting Injury	15

Side

Right	51
Left	19

Table 2

Score	Achieved ideal score	Did not achieve ideal score	p-value
Pivot Shift Test	69(98.57)	1(1.42)	<0.001
Lachman Test	68(97.14)	2(2.86)	<0.001
IKDC Objective Score	70(100%)	0	<0.001

Table 3

	Pre Operative	Post Operative	P value
Lachman test			<0.001
Negative	0	40	
+	5	28	
++	26	1	
+++	39	1	
Pivot Shift Test			<0.001
Negative	0	64	
+	6	5	
++	24	1	
+++	40	0	
IKDC Objective Score			<0.001
A	0	62	
B	3	8	
C	29	0	
D	38	0	
Mean HSS Score	74.6+-7.6	99.2+-0.4	<0.001

Results

Demographics

At Least Two Years Following Surgery, 70 Patients (45 Males And 25 Females, 51 right and 19 left knees) were available for clinical evaluation follow , 10%)

The Mean Age Of The Patient At Surgery Was 34.2 Years (range, 19 To 51 Years), And The Mean Interval From Injury To Surgery Was 4.2 Months (range, 1-8). The Average Follow-up Time Was 18.5 Months (range: 15 To 24 Months).

The Injury Resulted From Sports Participation In 55 Patients (78.5%) And Twisting Activities Of Daily Living In 15 (21.5%).

53 Of The 70 Patients Had A Meniscus Tear At The Same Time. There Were 34 Medial Meniscus Tears, 12 Lateral Meniscus Tears, And 7 Simultaneous Medial-lateral Meniscus Tears. A Partial Meniscectomy Was Performed On 21 Medial And 8 Lateral Menisci, Whereas Meniscal Repair Was Carried Out On 13 Medial And 4 Lateral Menisci.

Intraoperative.

47 Patients (67.14%) Out Of The 70 Had More Than 50% Coverage Of The Acl Graft By Remnant Tissue, While 23 Patients (32.8%) Had Less Than 50% Coverage.

Clinical Results

Post Surgery, The Mean Ikdc Objective Score And Hss Improved. (p < .001). Table 2 & Table 3 Provides A Summary Of The Findings From The Lachman, Pivot-shift, Ikdc Objective, And Hss Tests. Preoperative And Postoperative Values For The Lachman Test, Pivot-shift Test, Ikdc Objective Score, And Hss Score Deviated Statistically Different (p < .001). Four Of The Medial Meniscuses Had A Bucket-handle Tear And A 15° Extension Limitation. Three Individuals With Lateral Meniscus Tears Also Had A 12° Extension Limitation. After Surgery, They All Had Full Knee Extension. No Patient Had Any Extension Limitations Or Pain Two Years Following Surgery.

DISCUSSION

The First Significant Finding Regarding Tunnel Placement On The Femur Was The Following Anatomical Details: The Long Axis Of The Egg-shaped Footprint On The Femur Slopes 30 Degrees Toward The Posterior Of The Femur's Long Axis. In Particular, The Vertical Line (v-line) Drawn Through The Point Of Intersection Between The Femoral Condyle And The Tibial Plateau At 90° Of Flexion And The Long Axis Line Of The Acl Attachment Are The Two Lines Which Cross At The Center Of The Attachment (pl Point) Of The Posterolateral Bundle. The Earlier Research Published By Harner Et Al. Supports These Findings(13) For Knee Surgeons, The Information Obtained From The Anatomic Study Done For Arthroscopic Surgery Is Assumed To Be Practically Helpful.

In The Proximal Half, Where The Torn Remnant Tibial Stump Can Be Preserved, The Acl Generally Ruptures.(14).the Majority Of Mechanoreceptors Are Situated Near The Tibial Attachment Beneath The Subsynovium. (14,15).when Acl Tissue Was Preserved As Opposed To Removed Entirely, Testing Parameters Like Position Sense And Articular Stability Produced Significantly Better Results.(16,17) Proprioception, Vascularization, And Mechanical Stability Were All Restored In Their Patients Who Underwent Modified Double-bundle Acl Reconstructions With The Remaining Tissues Preserved.(18). In Order For The Graft To Heal The Remaining Acl Tissue And Act As A Scaffold For Regeneration At The Posterolateral (pl) Bundle Area Of The Acl, The Authors Suggested Pushing The Remaining Acl Tissue To The Lateral Area Of The Graft.(19)

There Are A Few Reports On Aclr With Remnant Preservation.(20 – 24) Compared A Group With Least Debridement And One With Normal Debridement. The Method Reported By Lee Et Al. Was Excellent. However, Despite The Sub-synovial Sheath Being Preserved, There Was A Chance Of Damaging The Acl Fibers Because It Required An Additional Proximal Incision For Tying, The Preserved Remnant Tissue Could Become Loose And Cause Cyclops Lesions, And The Remnant Fiber, Which Is Typically Continued To The Intercondylar Notch, Pcl, Or Lateral Wall, Could Be Artificially Cut Proximally.

Furthermore, Clinical Results Were Obtained From 16 Out Of 40 Patients Who Had This Procedure.

The Technique Reported By Gohil Et Al. Showed Level I Evidence Of Biological Healing. Nevertheless, Their Minimal Debridement Method Was Technically Challenging.

And Although There Was No Discernible Difference, There Was A Tendency Toward Cyclops Formation When Compared To The Normal Debridement Group (59% Vs. 37.5%).

Although Excessive Tissue Proliferation Linked To Extension Loss

Was Brought Up As A Concern With This Technique, The Current Study Demonstrated The Potential Benefits Of Remnant-preserving Acl Reconstruction Over The Standard Procedure By Improving Tissue Healing. Technically Speaking, Knees With A Large Remnant And Narrow Notch Width May Gain From Partial Resection Of The Preserved Remnant To Adjust The Overall Volume Of Tissue.

Conclusions

Clinical Results From Aclr Using Preservation And Femoral Tensioning Of The Remaining Tissue Were Good, And There Were No New Concerns About Improper Tunnel Formation. To Uncover The Function Of The Acl Remnant, Future Research Utilizing More Sensitive Examination Techniques And Long-term Follow-ups Would Be Extremely Beneficial.

REFERENCES

1. Ramjug S, Ghosh S, Walley G, Maffulli N. Isolated Anterior Cruciate Ligament Deficiency, Knee Scores And Function. *Acta Orthop Belg* 2008;74:643-51.
2. Lohmander Ls, Englund Pm, Dahl Ll, Roos Em. The Long-term Consequence Of Anterior Cruciate Ligament And Meniscus Injuries: Osteoarthritis. *Am J Sports Med* 2007;35:1756-69.
3. George Ms, Dunn Wr, Spindler Kp. Current Concepts Review: Revision Anterior Cruciate Ligament Reconstruction. *Am J Sports Med*. 2006;34:2026-2037.
4. Johnson Dl, Fu Fh. Anterior Cruciate Ligament Reconstruction: Why Do Failures Occur? *Instr Course Lect*. 1995;44:391-406.
5. Lee Bi, Kwon Sw, Kim Jb, Choi Hs, Min Kd. Comparison Of Clinical Results According To Amount Of Preserved Remnant In Arthroscopic Anterior Cruciate Ligament Reconstruction Using Quadrupled Hamstring Graft. *Arthroscopy* 2008;24(5):560-8.
6. Ahn Jh, Lee Sh, Choi Sh, Lim Tk. Magnetic Resonance Imaging Evaluation Of Anterior Cruciate Ligament Reconstruction Using Quadrupled Hamstring Tendon Autografts: Comparison Of Remnant Bundle Preservation And Standard Technique. *Am J Sports Med* 2010;38(9):1768-77.
7. Lee Bi, Kwon Sw, Kim Jb, Choi Hs, Min Kd. Comparison Of Clinical Results According To Amount Of Preserved Remnant In Arthroscopic Anterior Cruciate Ligament Reconstruction Using Quadrupled Hamstring Graft. *Arthroscopy* 2008;24(5):560-8.
8. Ahn Jh, Wang Jh, Lee Ys, Kim Jg, Kang Jh, Koh Kh. Anterior Cruciate Ligament Reconstruction Using Remnant Preservation And A Femoral Tensioning Technique: Clinical And Magnetic Resonance Imaging Results. *Arthroscopy* 2011;27(8):1079-89.
9. Ochi M, Adachi N, Uchio Y, Deie M, Kumahashi N, Ishikawa M, Et Al. A Minimum 2-year Follow-up After Selective Anteromedial Or Posterolateral Bundle Anterior Cruciate Ligament Reconstruction. *Arthroscopy* 2009;25(2):117-22.
10. Toritsuka Y, Shino K, Horibe S, Mitsuoka T, Hamada M, Nakata K, Et Al. Second-look Arthroscopy Of Anterior Cruciate Ligament Grafts With Multistranded Hamstring Tendons. *Arthroscopy* 2004;20(3):287-93.
11. Noh Jh, Yang Bg, Roh Yh, Lee Js. Synovialization On Second-look Arthroscopy After Anterior Cruciate Ligament Reconstruction Using Achilles Allograft In Active Young Men. *Knee Surg Sports Traumatol Arthrosc* 2011;19(11):1843-50.
12. Ahn Jh, Lee Ys, Ha Hc. Anterior Cruciate Ligament Reconstruction With Preservation Of Remnant Bundle Using Hamstring Autograft: Technical Note. *Arch Orthop Trauma Surg* 2009;129:1011-5.
13. Harner Cd, Baek Gh, Vogrin Tm, Carlin Gj, Kashiwaguchi S, Woo Sl. Quantitative Analysis Of Human Cruciate Ligament Insertions. *Arthroscopy* 1999;15:741-749.
14. [13 Sherman Mf, Lieber L, Bonamo Jr, Podesta L, Reiter I. The Long-term Followup Of Primary Anterior Cruciate Ligament Repair. Defining A Rationale For Augmentation. *Am J Sports Med* 1991;19(3):243-55.
15. Krause R, Schmitz F, Zoller G, Drenckhahn D. Distribution Of Neurofilament-positive Nerve Fibres And Sensory Endings In The Human Anterior Cruciate Ligament. *Arch Orthop Trauma Surg* 1995;114(4):194-8.
16. Zimny Ml, Schutte M, Dabezies E. Mechanoreceptors In The Human Anterior Cruciate Ligament. *Anat Rec* 1986;214(2):204-9.
17. Adachi N, Ochi M, Uchio Y, Iwasa J, Ryoike K, Kuriwaka M. Mechanoreceptors In The Anterior Cruciate Ligament Contribute To The Joint Position Sense. *Acta Orthop Scand* 2002;73(3):330-4.
18. Kim Sj, Jo Sb, Kim Tw, Chang Jh, Choi Hs, Oh Ks. A Modified Arthroscopic Anterior Cruciate Ligament Double-bundle Reconstruction Technique With Autogenous Quadriceps Tendon Graft: Remnant-preserving Technique. *Arch Orthop Trauma Surg* 2009;129(3):403-7.
19. Ahn Jh, Wang Jh, Lee Ys, Kim Jg, Kang Jh, Koh Kh. Anterior Cruciate Ligament Reconstruction Using Remnant Preservation And A Femoral Tensioning Technique: Clinical And Magnetic Resonance Imaging Results. *Arthroscopy* 2011;27(8):1079-89.
20. Lee Et Al. 17,20 (Lee Bi, Kwon Sw, Kim Jb, Choi Hs, Min Kd. Comparison Of Clinical Results According To Amount Of Preserved Remnant In Arthroscopic Anterior Cruciate Ligament Reconstruction Using Quadrupled Hamstring Graft. *Arthroscopy* 2008;24:560-568.
21. Ahn Jh, Lee Ys, Ha Hc. Anterior Cruciate Ligament Reconstruction With Preservation Of Remnant Bundle Using Hamstring Autograft: Technical Note. *Arch Orthop Trauma Surg* 2009;129:1011-1015.
22. Jackson Dw, Schaefer Rk. Cyclops Syndrome: Loss Of Extension Following Intra-articular Anterior Cruciate Ligament Reconstruction. *Arthroscopy* 1990;6:171-178.
23. Lee Bi, Min Kd, Choi Hs, Kim Jb, Kim St. Arthroscopic Anterior Cruciate Ligament Reconstruction With The Tibial-remnant Preserving Technique Using A Hamstring Graft. *Arthroscopy* 2006;22:340.e1-340.e7. Available Online At www.arthroscopyjournal.org.) Addressed The Aclr Study Results With Preservation.
24. Gohil S, Annear Po, Bredahl W. Anterior Cruciate Ligament Reconstruction Using Autologous Double Hamstrings: A Comparison Of Standard Versus Minimal Debridement Techniques Using Mri To Assess Revascularisation. A Randomised Prospective Study With A One-year Follow-up. *J Bone Joint Surg Br* 2007;89:1165-1171.