A Comparative Study Of Clinical And Functional Outcome Of Arthroscopic Anterior Cruciate Ligament Reconstruction Using Peroneus Longus Graft Vs Semitendinosus, Gracilis Graft"

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Abstract:

Introduction:

The Anterior Cruciate Ligaments (Acl) Injury Is A Contentious Topic In Which Extensive Research Was Done Worldwide For 2 Decades. Unlike Pcl, Acl Is Less Robust As Well As More Susceptible To Tearing. This Susceptibility Contributes To Instability In The Front Of The Knee When The Acl Is Torn, Which Is A Significant Clinical Challenge.

Aim And Objectves:

To Study The Pathology And Physiology Of The Anterior Cruciate Ligament Disruption, To Study The Arthroscopic Anterior Cruciate Ligament Reconstruction Using Semitendinosus And To Study The Arthroscopic Anterior Cruciate Ligament Reconstruction Using Peroneus Longus.

Materials And Methods:

A Prospective Study Was Done On 40 Consecutive Subjects Those Undergone Arthroscopy Assisted Anterior Cruciate Ligament Reconstruction From October 2022 To June 2024at Vinayaka Mission's Kirupanandavariyar Medical College And Hospitals At Seeragapadi, Salem Reconstruction Utilized St Tendon, Gracilis Tendon As Well As Fibularis Longus Tendon. All Patients Who Were Aged Between 15-60 Years, Who Were Skeletally Mature And Diagnosed With An Anterior Cruciate Ligament Injury Had Been Established By Performing Lachman Evaluation, Alongside Concurrent Meniscal Or Collateral Ligament Tears Requiring Repair, Were Eligible For Inclusion In This Academic Research. On Condition That Subjects Are Fit In Undergoing Rehab Following Anterior Cruciate Ligament Reconstruction, Which Involved Complete Load -Bearing Walking As Well As Unrestricted No-Load-Bearing Rom Were Included In The Study.

Results:

The Comparison Of Functional Outcome Between The Two Groups. Functional Outcome Was Measured Using Lysholm Scoring System, Which Was Assessed At 3 Months And At 12 Months. It Is Inferred From The Table That There Is No Difference Which Is Significant In The Functional Outcome Among 2 Groups Both At 12 Weeks As Well As At 12 Months. A

Statistical Significant Improvement Is Observed In Functional Scores Among Both Groups At The End Of 12 Months In Comparison With The Score At 3 Months.

Conclusion:

Morphologically The Peroneus Longus Has Better Features Than Semitendinosus In The Construction Of Aclgraft, Statistically Both The Semitendinosus And Peroneus Longus Has Similar Results However Functionally Pl Is A Better Graft In Female Subgroup, The Pl Tendon Is Particularly Beneficial Among Cases Involving Complex Injuries, Such As Those Affecting The Mcl, Having A Review Of Approximately 24months.

Key Words: Anterior Cruciate Ligament, Peroneus Longus, Semi Tendinosis, Graft.

Introduction:

The Anterior Cruciate Ligament's (Acl) Injury Is A Contentious Topic In Which Extensive Research Was Done Worldwide For 2 Decades. Unlike Pcl, Acl Is Less Robust As Well As More Susceptible To Tearing. This Susceptibility Contributes To Instability In The Front Of The Knee When The Acl Is Torn, Which Is A Significant Clinical Challenge. Unfortunately, The Acl Lacks The Inherent Ability To Heal Itself. Therefore, Individuals Experiencing Clinical Issues Due To Acl Damage May Opt For Acl Reconstruction Surgery. This Procedure Aims To Stabilize The Tibiofemoral Joint And Restore Function To The Knee Joint. Number Of Authors Had Successfully Detailed Anterior Cruciate Ligament Reconstruction With Auto Grafts Such As Hamstring Tendons, Patellar Tendons, And Quadriceps Tendons, As Well As Allografts Like Achilles, Patellar, Hamstring, Or Tibialis Anterior Tendons. Additionally, Acl Repair Had Been Performed Using Materials Such As Silver Wire, Fascia Lata, As Well As The Iliotibial Tract. Over Time, A Variety Of Procedures Had Been Detailed For Anterior Cruciate Ligament Reconstruction, Such As Open Procedures And Arthroscopic Methods. The Bptb Graft Remains The Usually Used Graft In Anterior Cruciate Ligament Reconstruction. At The Same Time, Concerns Over Issues Such As Knee Extensor Mechanism Complications, Decreased Rom, Patellar Fractures, Chronic Anterior Knee Ache Has Prompted Orthopaedicians Explore Alternative Autograft Material. Tendons Such As Semitendinosus Along With Gracilis, As Well As Peroneus Longus Have Been Viable Alternatives That Can Be Used Without Decreasing The Actions Of The Extensor Muscles Of Knee. Invention Of The Successful Arthroscope In 1954 Opened Up Novel Possibilities In The Domain Of Knee Surgery. Since 1982, Acl Reconstruction Has Frequently Been Carried Out Using Arthroscopic Techniques.

Arthroscopic Repair Of The Anterior Cruciate Ligament (Acl) Offers Several Advantages. It Is Minimally Invasive, Ensuring Greater Precision In Graft Positioning With Minimal Disruption To Surrounding Tissues. This Results In Early Recovery And Rehabilitation, Reduced Hospital Stays, And Reduced Risk Of Post-Operative Infections. Several Graft Options Are Available For Anterior Cruciate Ligament Repair, Each Tailored To Particular Injury And Patient's Profile Which Are Carefully Assessed Preoperatively. Among The Usually Used Grafts Are The Bone Patellarbone Autograft And The Quadrupled Hamstring Autograft. The Bonepatellarbone Autograft Has A Long Record Of Use But It Is Problematic Because Of The Anterior Knee Pain, Particularly Among Patients Whose Occupations Or Activities Involve Frequent Kneeling Or Sports Participation. Additionally, There Is A Risk Of Post-Operative Complications Such As Knee Cap Fracture, Fat Pad Fibrosis, Patella Tendon Contracture. Harvesting The Hamstring Autograft From The Medial Side Can Potentially Injure The Saphenous Nerve And Lead To Medial Knee Instability, Especially If Anterior Cruciate Ligament Disruption Is Combined With A Grade Iii Tear Mcl. Post-Operative Varus

And Valgus Instability Due To Collateral Ligament Injuries Also Increases The Risk Of Graft Failure. Anterior Cruciate Ligament Tears Along With Medial Collateral Ligament Tear Soften Result From High-Energy Trauma, Involving Larger Injury Zones. Studies Indicate A Higher Prevalence Of These Combined Injuries. Among Patients Who Has Existing Skin As Well As Soft Tissue Injuries At Insertion Site Of The Pes Anserine, Medial Hamstring Graft Harvesting Should Be Avoided To Prevent Surgical Site Infections. In Cases Requiring Revision Surgeries, Additional Autograft Material Can Be Advantageous. These Considerations Underscore The Significance Of Picking Up The Best Graft Type According To Individual Patient Characteristics As Well As Injury Specifics To Optimize Outcomes And Minimize Complications In Acl Reconstruction Surgeries. The Ideal Graft For Anterior Cruciate Ligament Repair Should Possess Adequate Strength, Size, And Be Safely Harvestable. Recent Literature Suggests Alternative Autografts Like Peroneus Longus Tendon. Zhaao And Huaangfuu Have Demonstrated Anterior 1/2 Of The Peroneus Longus Tendon Offers Suitable Length As Well As Strength For Acl Reconstruction. Initial Results After A Two-Year Follow-Up Have Shown Satisfactory Results. But There Is A Need For Direct Comparison Between The Functional Outcomes Of Anterior 1/2 Of The Peroneus Longus Tendon And The Hamstring Tendon.

Biomechanical As Well As Kinematic Studies Investigating Complete Removal Of Peroneus Longus Tendon Has Indicated That It Does Not Adversely Affect Gait Or Ankle Stability. These Findings Suggest That The Peroneus Longus Tendon, Particularly Its Anterior Half, Could Be A Viable Alternative Graft Option For Acl Reconstruction, Warranting Further Comparative Research To Establish Its Efficacy And Long-Term Outcomes. In The Study Referenced, Researchers Extracted Fresh Peroneus Longus Tendon, Hamstrings, And Acl From Patients Who Had Undergone Trans Femoral Amputation Above The Lower 1/3rd Of Thigh. These Tissues Were Then Subjected To Biomechanical Testing. A Grade Ii Or Higher Tear Of Medial Collateral Ligament Independently Increases Risk In Knee Joint Instability Following Acl Reconstruction Surgery. Due To Potential Challenges And Complications In Harvesting Hamstring Tendons Among The Cases Of Grade 3 Mcl Tears Associated With Acl Tears, In This Research The Aim Is In Introducing Alternative Autograft. Initially Establishing The Feasibility Of Using The Peroneus Longus Tendon As An Alternative, The Study Subsequently Presents In Vivo Data Demonstrating Safety As Well As Efficacy In Using Peroneus Longus Tendon For Anterior Cruciate Ligament Repair Alongside Medial Collateral Ligament Repair, Comparing It To The Established Gold Standard Of Hamstring Tendon Grafts.

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Tears Requiring Repair, Were Eligible For Inclusion In This Academic Research. On Condition That Subjects Are Fit In Undergoing Rehab Following Anterior Cruciate Ligament Reconstruction, Which Involved Complete Load -Bearing Walking As Well As Unrestricted No-Load-Bearing Rom Were Included In The Study.

Subjects Who Had Multi Ligament Injury, B/L Anterior Cruciate Ligament Tears, Anterior Cruciate Ligament Tear Accompanied By Periarticular Fractures And Ipsilateral Limb Fractures, Pediatricacl Tears Subjects Who Underwent Revision Anterior Cruciate Ligament Reconstruction. Simultaneous Musculoskeletal Injury Of Lowerlimb, Eg: Back, Hip Or Ankle Injury On Both Lower Limbs And Age <18 Years Were Excluded From The Study.

Results:

Table 1: Age Based Distribution Among The Patients

Age	Group 1		Group 2		P Value
	Frequency	Percentage	Frequency	Percentage	
<20	0	0	1	5.5%	0.375
20 – 30	12	54.5%	7	38.8%	
31 – 40	09	40.9%	7	38.8%	
41 – 50	1	4.5%	1	5.5%	
>50	0	0	2	11.1%	
Total	22	100%	18	100%	
Mean ± Sd	32.8 ± 3.6		33.2 ± 5.2		

P Value Derived By Applying Student T Test

Table 1 Shows The Age-Based Distribution Of The Patients. As Mentioned In Table That Majority Of The Patients In Both Groups Were From 20 To 40 Years' Age As Well As There Is Nil Statistical Significant Difference Among The Age Group Between The Group 1 And Group 2.

Table 2: Gender Based Dispersal Of The Patients

Gender	Group 1		Group 2		P Value
	Frequency	%	Frequency	%	
Male	15	68.1%	11	61.1%	0.285
Female	7	31.8%	7	38.8%	
Total	22	100%	18	100%	

P Value Derived By Applying Chi-Square Test

Table 3 Depicts The Gender Based Dispersal Of The Patients. As The Table Shows That Males Were More In Number Compared To Opposite Gender In Both Group I And Group Ii As Well As There Is Nil Statistical Difference Among Gender In Both Group I And Group Ii.

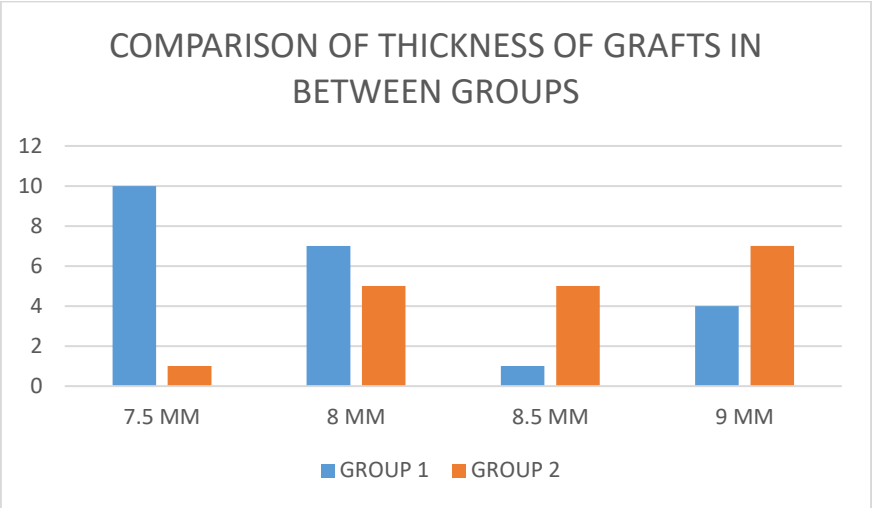
Table 3: Comparison Of Strands Used In Graft Among The Two Groups

Number Of Semitendinous Strands Used	Group 1	Group 2	P Value
4	14 (63.6%)	10 (58.8%)	0.612
6	8 (36.3%)	8 (41.1%)	
Total	22 (100%)	18 (100%)	

P Value Obtained Using Chi-Square Test

Table 3 Depicts The Comparison In Number Strands Used In Graft Among The Two Groups. From The Above Mentioned Table It Is Depicted That Both Groups For Most Of The Subjects 4 Semitendinosus Strands Have Been Used And There Is No Significant Difference Concerning The Graft Used Among Two Groups.

Graph 1: Comparison Of Thickness Of Grafts Used Among Both The Groups



Graph 1 Depicts Comparison Of Thickness Of Grafts Used Among Both Groups. It Is Depicted From The Above Table That For The Patients In Group A Lesser Thickness Graft Was Used Compared To The Patients In Group B Where For Majority Of The Patients The Thickness Of Graft Used Was 9 Mm And This Difference Is Found To Be Significant Statistically (P-Value 0.018).

Table 4: Co-Morbidity Wise Comparison Of Functional Outcome Among 2 Groups

Co-Morbidities	Lysholm Score @ 3 Months		P Value	Lysholm Score @12 Months		P Value
	Group 1	Group 2		Group 1	Group 2	
Acl Tear Alone	91.2 ± 2.7	92.2 ± 3.4	0.516	98.4 ± 1.5	99.5 ± 0.83	0.629
Acl With Bhmt	94.5 ± 2.9	89.3 ± 6.1	0.358	98.5 ± 0.86	96 ± 4.3	0.216
Acl With Lmt	90.6 ± 1	94.3 ± 3.2	0.426	96.6 ± 2.5	99.3 ± 0.94	0.269
Acl With Mcl Tear	Nil	91.5 ± 3.5	-	Nil	99 ± 1	•

P Value Depicted By Applying Student T Test

Table 4 Shows The Various Co-Morbidity Wise Comparison Of Functional Outcome Among The 2 Groups. It Is Depicted From The Above Table That The Comorbidities Haven't Influenced The Functional Scores Among Both Groups, As The Functional Outcome Did Not Show Any Major Change With Respect The Different Co-Morbidities.

Table 5: Comparison Of Functional Scores Among 2 Groups Using Lysholm Knee Scoring Scale

Functional Outcome	Group 1 (Hamstring)		Group 2 (Pl)		P Value
	Mean	Standard Deviation	Mean	Standard Deviation	
Lysholm Score @ 3 Months	92	3	92.1	4.3	0.979*
Lysholm Score@12 Months	98.3	1.6	98.8	2.4	0.450*
P Value	<.0001#		<.0001#		

*- P Value Derived For Intergroup Comparison

#- P Value Derived For Intragroup Comparison

Table 5 Shows The Comparison Of Functional Outcome Between The Two Groups. Functional Outcome Was Measured Using Lysholm Scoring System, Which Was Assessed At 3 Months And At 12 Months. It Is Inferred From The Table That There Is No Difference Which Is Significant In The Functional Outcome Among 2 Groups Both At 12 Weeks As Well As At 12 Months. A Statistical Significant Improvement Is Observed In Functional Scores Among Both Groups At The End Of 12 Months In Comparison With The Score At 3 Months.

Discussion:

The Semitendinosus Tendon Is Frequently Used As A Graft In Reconstructing The Acl. Although, There Are Notable Variations In Its Thickness As Well As A Short Graft Length Is Recognized Risk Factor Contributing To The Failure Of Anterior Cruciate Ligament Reconstruction. A Minimum Cross-Sectional Diameter Of 8mm Is Recommended For Graft Tissue, That Will Be Challenging Using The St Tendon Alone While Maintaining Sufficient Length. While The St Tendon Is Being Harvested There Is An Increase In The Risk Of Wound Complications And Infection, Especially In Cases With Anterior Cruciate Ligament Injury Accompanied With Grade 3 Mcl Injuries On Same Side. There Is Also Concern About Potential Instability In Medial Compartment Of The Tibiofemoral Joint, Inspite Of The Fact This Has Not Been Conclusively Proven. In Cases Of High-Energy Injuries Affecting Medial Part Of Knee Joint And Causing Grade 3 Mcl Injury, Doubts May Arise Regarding The Credibility Of Using Stg As Grafts. Additionally, In Scenarios Involving Multifilament Injuries And Reconstructions In Children, Securing Appropriate Autograftsources Shall Be Challenging. Some Studies Have Explored The Peroneus Longus Graft As An Alternative To The Stg Graft In Such Cases. Functional Outcomes Of Anterior Cruciate Ligament Reconstructing Surgeries Using 2 Grafts—One Peroneus Longus And The Other Semitendinosus Are Nearly Comparable. However, A Notable Case Involved A Patient Managed Using A Quadrupled Stg Who Exhibited Significantly +Ve Anterior Drawer Examination Postoperatively After Half A Year, Despite Nil History Of Rigorous Exercise

Or Additional Trauma. Graft's Resorption Is Observed On Magnetic Resonant Imaging, Contrasting With The Absence Of Such Complications In The Pl Graft, That Will Typically Maintain A Larger Diameter Than The Consistently Smaller Four-Strand Semitendinosus Tendon.

Previous Research Has Indicated That On Pl Tendon Harvesting There Has Been Negligible Impact On Foot As Well As Ankle Activities, A Finding Supported By This Research. Primary Functions For The Pl Include Eversion Of Feet And Flexion Of First Toe Plantar Wards. One And Only One Potential Drawback Of Taking This Tendon Is The Risk Of Ankle Instability Due To Reduced Strength In Everting As Well As Flexing Plantar Wards. This Research Conducted Indicates Only Slight Reductions Of Ankle Rom And Its Power Before The Operation And After The Operation. Use Of P L Tendon Has Decreased Impact For Preserving The Foot Arches. Specifically, Longitudinal Arch In The Medial Side Is Supported By The Abductor Haluciis Muscle, Post Tibiailis Tendon, As Well As Fpl, While The Longitudinal Arch On Lateral Side Of Foot Is Stabilised By The Fibularis Brevis Along With Abductor Digitus Minimus. Horizontal Arch Of Foot Is Upheld With Help Of Tibialis Posterior Tendon And Aducttor Polliciis.

Thus, Based On These Studies, It Can Be Inferred Foots Stability Is Unlikely To Be Significantly Affected With The Use Of A Pl Tendon Graft. Because Of Its Straightforward And Harmless Harvesting Techniques, The Pltendon Graft Emerges To Be A Highly Suitable Choice For Reconstructing The Acl. Its Superficial Location Allows For Quick Exposure Similar To That Of The Semitendinosus Tendons. Additionally, There Are Fewer Complications Associated With Structures Surrounding P L Tendon Compared To Stg Tendons, Simplifying The Graft Harvesting Process. Moreover, Biological As Well As Mechanical Actions Of The Peroneus Longus Tendon Are Considered Excellent. According To Huuaangfuus And Zahoo‟S Research, Outcomes Indicated That Failing Rates In Reconstructing Using Both The Sttendon As Well As The Pl Tendon Graft Was Comparable As Well As Significantly Having Good Results Than Those Using Gracilis Tendon. Length Of The P L Graft Available For Reconstruction Are Considered More Optimal Compared To The Gracilis And Semitendinosus Tendons, Although Consideration Must Be Given To Donor Site Morbidity During Graft Harvesting. Angthong And His Colleague's Hospital Investigation Involved The P L Tendon Across Twenty-Four Patients, Comparisons Between Normal As Well As Affected Sites Revealed Significant Impacts On Ankle Stability And Function. However, Kerimoğlu Et Al.'S Studies Reported No Issues Concerning Stability And Ankle Function (15). Despite The Varying Findings And Limitations In Sample Size, Such As In The Angthong Et Al. Study, Which Were Not Entirely Conclusive Regarding Decreased Function In The Ankle, Orthopaedic Persons Are Hesitant In Utilizing Pl Graft For Harvesting Till More Robust And Biologically As Well As Mechanically Favourable Research Reports Become Available.

Conclusion:

Morphologically The Peroneus Longus Has Better Features Than Semitendinosus In The Construction Of Aclgraft, Statistically Both The Semitendinosus And Peroneus Longus Has Similar Results However Functionally Pl Is A Better Graft In Female Subgroup, The Pl Tendon Is Particularly Beneficial Among Cases Involving Complex Injuries, Such As Those Affecting The Mcl, Having A Review Of Approximately 24months. It Serves As A Viable Alternative Compared To Different Autograft Options Also Can Be Useful In Revision Surgeries. Understanding The Review Of Structures As Well As Function Of Both The Graft Site And Pl Tendon Is An Add On To The Orthopaedic Surgeon's Capabilities.

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