

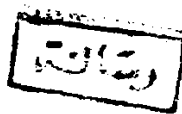
***Arthroscopically assisted
reconstruction of the anterior cruciate ligament
with use of autogenous patellar ligament graft***

Thesis

Submitted for requirement of partial fulfilment of M.D. in
orthopedic surgery

By

Ahmed Mohamed El-saeed Abdalla
M.B. , B.CH. , M.Sc . (Orthopedics)



Under supervision of

Prof. Dr. Ousama Shata
Professor of orthopedic surgery
Ain Shams University

Prof. Dr. Alaa Hefny
Assistant professor of orthopedic surgery
Ain Shams University

Dr. Tarek Khalil
Lecturer of orthopedic surgery
Ain Shams University

Medical school
Ain Shams University
1997





Acknowledgements

I would like to express my deepest gratitude to my professors and supervisors :

*-Prof. Dr. **Ousama Shata** for his encouragement and support ,he spent long hours of his time discussing the subject with me with his always creative ideas and positive criticism .*

*-Prof. Dr. **Alaa Hefny** who gave me his support to produce this thesis , he has always been kind and encouraging , I am greatly indebted to him .*

*-Dr. **Tarek khalil** who was behind all this ;he taught me how to do arthroscopy , he gave me the opportunity to do this work .*

Sincere thanks are also extended to :

-Prof. Dr. Timour El-hosini and Prof. Dr. Ezat Kamel for their valuable remarks , technical help and meticulous guidance

Sincere thanks are also extended to the senior medical staff and my colleagues in the orthopedic department for their support and co-operation .

CONTENTS

Review of the literature

Introduction	5
Anatomy of the ACL	7
Biomechanics of the ACL	22
ACL injuries	40
ACLgraft materials	46
Effects of harvesting patellar tendon autograft	49
Healing response of the ACL	53
Biology of healing of autogenous ACL grafts	55
Current concepts in ACL reconstruction	
* notchplasty	60
*ligament isometry	62
*tension of the ACL substitute	66
*fixation of the ACL substitute	68
Rehabilitation after ACL reconstruction	74

The work

Aim of the work	86
The material	86
The method	95
Postoperative rehabilitation	115
The results	120
Complications	127
Case presentation	129
Discussion	134
The English summary	145
The Arabic summary	147
References	149

Abstract

-Ahmed Mohamed El-saeed Abdalla . Arthroscopically assisted reconstruction of the anterior cruciate ligament with use of autogenous patellar ligament graft . M.D. in orthopedic surgery .
Orthopedic Department , faculty of medicine Ain Shams University , 1996

The aim of this work was to assess the results of arthroscopic ACL reconstruction . 30 patients were included in this study . These patients were operated upon for their ACL deficient knees . Using the arthroscope helped too much in reducing the morbidity of this surgery and allowed the patients to recover earlier than other techniques .The patients were followed-up for at least 12 months with an average of 17.2 months.
Evaluation was done by :

- 1) Scoring system
- 2) Clinical assesment

Arthroscopically assisted technique for ACL reconstruction was developed as an alternative to the open procedure .With this technique only minimum incisions in the knee capsule and synovial membrane are needed ,and the isometric points of attachment are easier to identify, also other intra-articular knee pathology could be dealt with . An early active motion program of rehabilitation without the needs for external support was applied to all of our patients .The autogenous patellar tendon graft is the most common graft used nowadays and biomechanical studies support its superiority to other grafts .

(key words :ACL - Arthroscope - minimum incisions-isometric - patellar tendon autograft -early active motion program of rehabilitation)

List of tables

1.1	Maximum load for the human ACL	49
2.1	The physical findings	98
3.1	The mean pre and post operative subjective scores	121
3.2	The results of objective assessment	125
4.1	Comparison of the results of this study and the results of Aglietti study .	142
4.2	Comparison of arthrotomy and arthroscopic ACL surgery .	143

List of figures

1.1-1.2	femoral attachment of the ACL	8
1.3-1.4	tibial attachment of the ACL	10
1.5	the spiral distribution of the ACL	10
1.6	change in the shape and tension of ACL	13
1.7-1.8	blood supply of the ACL	15
1.9	nerve supply of the ACL	18
1.10	nerve supply of the ACL	19
2.1-2.2	instant center of rotation and surface velocity vector	23
2.3	pure rolling motion	24
2.4	femoral and tibial contact points	25
2.5-2.6	four bar linkage	27
2.7	movement of the instant center of rotation	29
2.8	surface velocity vector	30
2.9	response of the ACL to tensile loading	32
2.10	force versus displacement	34
2.11	anterior drawer and Lachman test	35
3.1	size of patellar tendon graft after transplantation	56
3.2	type of fiber in ACL, graft and patellar tendon	58
4.1	isometric sites for ACL	64
4.2	angulation at tunnel entrance	80

5.1	sex distribution	87
5.2	age distribution	88
5.3	side of injury	89
5.4	cause of injury	90
5.5	injury operation delay	91
5.6	previous surgery	92
5.7	associated pathology	93
5.8	presenting symptoms	94
6.1	Lachman test	95
6.2	anterior drawer test	96
6.3	pivot shift test	96
6.4	position of the patient	100
6.5	ACL arthroscopic instruments	101
6.6	” ” ”	
6.7	” ” ”	
6.8	” ” ”	
6.9	” ” ”	
7.1-7.23	operative steps	103
8.1-8.8	postoperativ rehabilitation	115
9.1	pre and post operative lysholm score	121
10.1-10.2	x-ray of the patient 6 weeks postoperative	130
10.3	patellar tendon autograft 6 months postoperative	132
10.4	x-ray of the patient	133

INTRODUCTION

Few musculoskeletal conditions have stimulated as much controversy and research as an injury to the anterior cruciate ligament (ACL). Once considered the beginning of the end of the normal knee function, the current prognosis with appropriate treatment appears improved, at least, over the short term. The problem of the ACL injury should not be considered solved as long term outcome studies and proof that degenerative joint disease can be delayed or prevented are desperately needed.

Since the first reported surgical repair of an ACL by **Mayo Robson** in 1895 at the general infirmary in Leeds, U.K. the orthopaedic literatures have become full of experimental investigations and clinical reports on virtually every aspect of the ACL (**Burnett and Fowler**, 1985). Despite all these informations no single opinion exists as to the best way to treat the ACL once it is damaged. This may reflect not a difference in the philosophy of stabilizing ACL deficient knee but rather a difference in the approach used to solve this injury. Individuals who have a torn ACL are frequently troubled by chronic instability of the knee and recurrent episodes of giving way, which often are associated with intra-articular injuries (**Noyes et al**, 1983).

Efforts to reconstruct the ACL have resulted in the development of several different techniques involving the use of prosthetic ligaments (**Bolton and Bruchman**, 1985), (**Khalil T.**, 1991), autogenous grafts and allografts composed of fascia lata (**Bertoria et al**, 1985), semitendinosus tendon (**Wilson and Nicholas**, 1993) or patellar tendon (**Clancy et al**, 1982).

The results after reconstruction of the ACL with the use of the central one-third of the patellar ligament and open arthrotomy have been reproducible and acceptable . **Clancy et al 1982**, and **O'Brien et al 1991** reported success rate of 90% after use of this open procedure . However the postoperative complications have included loss of knee motion (**Paulos et al,1987**) and pain in the patellofemoral joint (**Sgaglione et al 1990**) .

Arthroscopically assisted technique for ACL reconstruction was developed as alternative to the open procedure (**Daniel et al 1993**) . With this technique only minimum incisions in the knee capsule and synovial membrane are needed ,and the isometric points of attachment are easier to identify ,also other intra-articular associated pathology could be dealt with (**Odensten and Gillquist 1985**) .

The success of any ligamentous reconstructive procedure depends on many factors . Accurate diagnosis and classification of the ligament instability present is made preoperatively and confirmed with the patient under anesthesia. The examination should establish the presence or absence of the components of anterior, valgus, varus, and rotatory instability of the particular knee. The arthroscope is an important tool for expanding the diagnosis and treatment of associated injuries to the menisci, capsular structures, and articular cartilage.