Contents	
Acknowledgment	i
List of figures	ii
List of tables	iii
Introduction	1
Relevant arthroscopic anatomy of the knee	4
Relevant knee biomechanics:	11
Knee movement	
Knee stability	
Contact area & Force	
Articular cartilage microstructures:	21
Chondreytes	
Extra-cellular matrix	
Zone of articular cartilage	
Articular cartilage turnover, Remodeling & Repair:	34
Matrix turnover	
Repair of articular cartilage defects	
Remodeling	
Physiology & Mechanical properties of articular cartilage:	37
Biphasic nature of articular cartilage	
Behavior under tension	
Effect of joint motion and modeling	
Biomechanical & Topographic consideration for OAT grafting in the knee	46
Pathology of knee articular cartilage degeneration	52
Etiology of articular cartilage degeneration	
Pathological changes with articular cartilage injuries	
Classification of articular cartilage injury	61
Diagnostic work up in articulate cartilage defect	64
Recent MRI practice in chondral injure	
Treatment of articular cartilage lesions	72
Debridement	
Marrow stimulation techniques	
Transplantation to fill defect	
Cell-based therapies	
Pharmacological factors	
Patients	95
Methods	102
Results	122
Case presentation	145
Discussion	161
Summary & Conclusion	176
Reference	180
الملخص العربي	

List of figures

No.	Figure	Page
1	Anatomy of the knee joint	5
2	Axes and Instant center of motion of knee joint	12
3	Menisci help to increase load bearing area & act as wedge	13
4	Biomechanics of cruciate ligaments	15
5	Popliteus and screw-home mechanism	16
6	Anatomical and Mechanical axis of knee joint	19
7	Cartialge cell surrounded by extracellular matrix containing collagen fibrils by TEM.	24
8	Cartilage collagen fibril & Structure of collagen triple helix	24
9	Structure of α - helices.	26
10	Schematic presentation of cartilage extracellular matrix.	29
11	Illustrate core proteoglycans	30
12	Illustrate vertical section of articular cartilage	33
13	Illustrate structures respond for load in articular cartilage	39
14	Viscoelastic behavior of articular cartilage, fluid efflux and solid matrix compaction until reach equilibrium state	41
15	Stretching and deformation of the collagen fibrils and proteoglycan molecules	42
16	Tensile moduli of articular cartilage	43
17	Under impulsive compressive loads, the cartilage experiences a relatively large lateral displacement	45
18	Typical selected donor and recipient sites.	46
19	Donor and recipient site average contact pressure	47
20	Typical maximum curvature map	48
21	Maximum curvature of donor and recipient sites	48

22	Typical cartilage thickness map	49
23	Donor and recipient site of cartilage thickness	49
24	Diagrammatic illustration of articular cartilage injury etiology	52
25	(A) Non arthritic knee (B) Arthritic knee	60
26	Outerbridge arthroscopic classification for articular cartilage injury	63
27	ICRS grading of articular cartilage injury	63
28	Clinical examination, Valgus stress test.	65
29	(A) MRI "High- field- strength fast spin-echo imaging" (B) High-resolution short echo time spectroscopic imaging	69
30	MRI to Osteochondral autograft transplant to femoral condyle defect	70
31	Arthroscopic and MRI picture images demonstrate the wrong angle during harvesting and inserting the graft	71
32	Arthroscopic shaving of loss chondral flab	75
33	Arthroscopic view following thermal chondroplasty	76
34	Debridement and drilling of subchonral bone	78
35	Articular cartilage defect treated by microfracture	79
36	Autologous osteochondral mosaicplasty	84
37	Osteochondral autograft transplantation (OATS)	85
38	Treatment of ostechondral defect by autologus chondrocytes transplantation	89
39	Age incidence	97
40	Sex incidence	98
41	Duration of symptoms prior to surgery	99
42	Follow up period	100
43	Associated knee injuries	101
44-A	Color coded sizer tamps." Instrumentation"	108

44-B	Donor & recipient tube harvesters." Instrumentation"	108
44-C	Driver extractor." Instrumentation"	109
44-D	Alignment rod." Instrumentation"	109
44-E	Pin calibrator." Instrumentation"	109
45	Location of portal site by spinal needle	110
46	Selection of donor site	111
47	Chondral defect size determination	112
48	Insertion of harvest	112
49	Donor core harvesting	113
50	Recipient socket creation	114
51	Use of alignment stick.	115
52	Donor core insertion" graft delivery"	115
53	Final core seating	116
54	Donor sockets left open after harvesting	117
55	Relation between symptoms duration and post-operative results	126
56	Shows x-rays & MRI scans of female 44 years old RT. knee with big focal defect about 2Cm	143
57	Follow up x-rays & MRI scans of graft failure complication	144
58	Case No. 35 (a) Pre-operative plain X-ray.	145
	(b) Pre-operative MRI scan before knee arthroscopy.	146
	(c) Arthroscopic view of cartilage defect.	146
	(d) Follow up MRI scan after 3months of cartilage repair.	147
	(e) Follow up MRI scan after 6 months of cartilage repair	147
59	Case No. 4 (a) Pre-operative plain X-ray with mild degenerative changes .	148
	(b) Pre-operative MRI show cartilage defect.	149
	(c) Arthroscopic pictures of the cartilage defect pre and post OAT	149
	(d) Follow up MRI scan after three months of cartilage repair	150

60	Case No. 27 (a) Pre-operative plain X-ray show cartilage defect	151
	(b) Operative arthroscopic pictures of part of cartilage defect	151
	(c) Operative Rt. knee arthrotomy show the size of the cartilage defect	152
	(d) Operative picture of the cartilage defect after repair by OAT grafts two cores harvested from intercondylar notch	152
61	Follow up MRI scan after three months of cartilage repair show stable grafts and congruent articular cartilage surface.	153
62	Post-operative follow up after sex months with full rang of knee motion.	154
63	Case No. 12(a) Pre-operative plain X-ray	155
	(b) Arthroscopic pictures of the of the cartilage defect	155
	(c) Operative Rt. knee mini-arthrotomy show the site of the cartilage defect followed by repair of the defect by OAT graft	156
	(d) Follow up MRI scan after three months of cartilage repair.	157
64	Case No.28 (a) Pre-operative plain X-ray	158
	(b) Pre-operative MRI scan	159
	(c) Arthroscopic pictures of the cartilage defect pre and post OAT repair	159
	(d) Follow up MRI scan after three months	160
1		

List of Tables

No.	Table	Page
1	Known causes of joint degeneration	55
2	Stages in development and progression of degeneration of articular cartilage injury	57
3	Difference between changes in articular cartilage due to aging and those due to degeneration in osteoarthrits	59
4	The outerbridge arthroscopic classification	61
5	ICRS Articular cartilage grading system	62
6	Difference between ostechondral and chondral lesions	65
7	Categories of treatment of articular cartilage	74
8	Presentation of the patients and study	96
9	Age incidence	97
10	Sex incidence	98
11	Operated side incidence	98
12	Duration of symptoms prior to surgery	99
13	Follow up period	100
14	Associated knee injuries	101
15	The Hospital for Special Surgery knee service rating system (H.S.S.)	103
16	Preoperative clinical score	122
17	Clinical score of postoperative results	123
18	Relation between pre-op. clinical score & post-op. results	124
19	Pain grade distribution preoperatively	127
20	Relation between pre-operative and post-operative results	127
21	Pre-operative walking ability	128
22	Relation between walking ability and post-operative results	128

23	Relation between pre-operative climbing stairs and post-operative results	129
24	Pre-operative knee flexion range	130
25	Relation between pre-operative flexion range and post0operative results	130
26	Size of chondral defect	131
27	Relation between size of chondral defect and post-operative results	131
28	Site of chondral defect	132
29	Relation between site of chondral defect and post-operative resultes	132
30	Relation between articular cartilage congruence and post-operative results	133
31	Meniscal injury incidence	134
32	Relation between meniscal injury and post-operative results	134
33	Arthroscopic finding other than chondral and meniscal injury	135
34	Arthroscopic procedures	135
35	Relation between duration of follow-up and post-operative results	136
36	Patient assessment	137
37	Relation between patient assessment and post-operative results	137
38	Post-operative pain	138
39	Relation between pre-operative and post0operativ pain	138
40	Post-operative walking ability	139
41	Relation between pre-operative and post-operative waling ability	139
42	Relation between pre-operative and post-operative climbing stairs ability	140
43	Relation between pre-operative and pos-operative maximum flexion	141