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SYSTEMIC REVIEW OF MANAGEMENT OF KNEE OSTEOCHONDRITIS DISSECANS BY MOSAICPLASTY

(REVIEW ARTICLE)

By

Hassan Mohamed Hassan, Mohamed M. Besar and Emad M. Zayed

Department of Orthopedic Surgery, Faculty of Medicine, Al-Azhar University, Egypt

E-mail: dr.hassan90@hotmail.com

ABSTRACT

Background: Osteochondritis dissecans (OCD) is a pathological process affecting the subchondral bone of the knee in children and adolescents with open growth plates (juvenile OCD) and young adults with closed growth plates (adult OCD). It may lead to secondary effects on joint cartilage, such as pain, edema, possible formation of free bodies and mechanical symptoms, including joint locking.

Objective: To detect the osteochondral auto graft Transplantation in Management of OCD Knee as regards clinical outcomes and complications.

Subjects and methods: This systematic review include 14 original articles published from January 2014 to June 2019 which was that 14 studies were included prospective studies were the commonest type appeared in 6 studies followed by Case series in 4 studies , retrospective in 3 studies and Randomized controlled trial in one study.

Results: Results of the study revealed that the commonest score used to assess outcome was: Knee Injury and Osteoarthritis Outcome Score (KOOS) which used in 5 studies and shows improvement after treatment, International Knee Documentation Committee (IKDC) scores appeared in 4 studies preoperative and postoperative values shows significant increase postoperative, Hospital for Special Surgery (HSS) appeared in one study, and results revealed that 54 cases showed complications, graft failure founded among 16 cases and 34 needs reoperations.

Conclusion: On the basis of the good clinical and MRA results obtained at long-term follow-up, mosaicplasty can be considered a safe and reliable option for the treatment of unstable OCD in adult patients.

Keywords: Complications, IKDC scores, Osteochondritis dissecans, Systematic Review, Treatment.

INTRODUCTION

Articular cartilage defects are incapable of self-repair. They are acquired defects, often from trauma or osteochondritis dissecans (OCD. Patients can be fit, active and have a high functional demand and high xpectations. If untreated, lesions of articular cartilage can progress to osteoarthritis of the joint. The underlying subchondral bone support plays a role in the stability and outcome of any repair. A number of different surgical techniques have been described for the treatment of these lesions. These techniques include micro fracture, autologous osteochondral cylinder transplantation (mosaicplasty), artificial bone graft substitutes and cell-based repair techniques such as autologous

chondrocyte implantation (ACI) *(Hindle et al., 2013).*

The present study aimed to detect osteochondral autograft transplantation in management of OCD knee as regards clinical outcomes and complications.

PATIENTS AND METHODS

The following information/data were extracted from studies that met the inclusion criteria: name of the first author, year of publication, study design, number of participants in each treatment group, participants' age and gender, type of intervention in Osteochondral Auto graft Transplantation in management of OCD knee. Search terms used were suspensory mechanism Osteochondral Auto graft Transplantation techniques

The electronic databases up to June 2019 of 'Pub med Medline', 'EMbase', and 'Google Scholar' were explored using the combination of the following search-terms:

Inclusion criteria:

English-language original articles published from January 2014 to June 2019, Adults older than 18 years old and All RCTs , clinical trials , case control , case report or cohort study of the subjective and objective outcomes, and complications of Mosaicplasty.

Exclusion criteria:

Patients with lesions less than 3 cm, patients treated conservatively, meta-analyses or nonhuman studies, those where it is impossible to tell from the abstract or title that they meet the described inclusion criteria, or patient underwent surgical interventions before in the knee.

Statistical Analysis:

A primary search of databases yielded 420 records. After duplicates removal, 328 potentially eligible articles were identified. A total of 14 studies fulfilled the inclusion criteria, and were included in the final systematic review.

RESULTS

Total number of patients was 328, Mean age of the included patients was 32 years, Median was 31.85 years, Minimum - Maximum 21.2-40.8, and (228 69.5%) of included cases were females **(Table 1)**.

Mean defect size was 4.2 (cm2), Median was 3.8, Minimum- Maximum 3-6.1 **(Table 2)**.

The commonest score used to assess outcome was KOOS which used in 5 studies and shows improvement after treatment, IKDC scores appeared in 4 studies preoperative and postoperative values shows significant increase postoperative, HSS appeared in one study **(Table 3)**.

54 cases showed complications graft failure founded among 16 cases and 34 needs reoperations **(Table 4)**.

Table (1): Characteristics of the included studies

Study	Year	Age (y)
Quarch et al., 2014	2014	NR
Astur et al., 2014	2014	37.6
Ulstein et al., 2014	2014	32.7
Zak et al., 2014	2014	38
Aldrian et al., 2014	2014	33.3
Hindle et al., 2014	2014	35.8
Filardo et al., 2014	2014	30.2
Miller et al., 2015	2015	ND
Ronga et al., 2015	2015	21.2
Clavé et al., 2016	2016	28.3
Erol et al., 2016	2016	40.8
Zellner et al., 2017	2017	29
Solheim et al., 2017	2017	31
Carey et al., 2019	2019	26.1

Table (2): Defect size

Study	Year	Defect size (cm^2)
Quarch et al., 2014	2014	4.6
Astur et al., 2014	2014	NR
Ulstein et al., 2014	2014	3
Zak et al., 2014	2014	5.8
Aldrian et al., 2014	2014	3.8
Hindle et al., 2014	2014	4.5
Filardo et al., 2014	2014	3
Miller et al., 2014	2015	3
Ronga et al., 2015	2015	3.8
Clavé et al., 2016	2016	4.07
Erol et al., 2016	2016	3.7
Zellner et al., 2017	2017	6.1
Solheim et al., 2017	2017	3.4
Carey et al., 2019	2019	6

Table (3): Outcome assessments score used

Parmeters / Study	HSS pre	HSS post	IKDC score pre	IKDC score post	KOOS Pain	KOOS Symptoms	KOOS ADL	KOOS Sport/ Rec	KOOS QoL
Quarch et al., 2014	ND	ND	ND	ND	ND	ND	ND	ND	ND
Astur et al., 2014	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ulstein et al., 2014	ND	ND	ND	ND	Δ11.8	Δ8.5	Δ7.5	Δ41.3	Δ25
Zak et al., 2014	ND	ND	ND	ND	Δ19.5	Δ3.6	Δ16.5	Δ20	Δ18.7
Aldrian et al., 2014	ND	ND	44.1	59	69	50	75	39	51
Hindle et al., 2014	ND	ND	ND	ND	77	60	81	40	43
Filardo et al., 2014	ND	ND	34.5	66.3	ND	ND	ND	ND	ND
Miller et al., 2015	ND	9.46	ND	ND	ND	ND	ND	ND	ND
Ronga et al., 2015	ND	ND	ND	ND	ND	ND	ND	ND	ND
Clavé et al., 2016	ND	ND	**39.6**	**78.9**	ND	ND	ND	ND	ND
Erol et al., 2016	ND	ND	**ND**	70.2	ND	ND	ND	ND	ND
Zellner et al., 2017	ND	ND	42.6	79.7	ND	ND	ND	ND	ND
Solheim et al., 2017	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carey et al., 2019	ND	ND	ND	ND	79.3	60.2	85.5	53.9	52.7

Table (4): Complications

Parameters / Study	Complications (n)	infection	DVT	non-union	delayed union	graft failure	edema	Intra-articular effusion	hematoma	popliteal cyst	Persistent pain	arthrofibrosis	Reoperations	adhesion
Quarch et al., 2014	1	0	0	0	0	0	1	0	0	0	0	0	0	0
Astur et al., 2014	3	0	0	0	0	0	0	0	0	0	0	3	0	0
Ulstein et al., 2014	4	0	0	0	0	0	0	0	0	0	0	0	5	0
Zak et al., 2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aldrian et al., 2014	3	0	0	0	0	0	0	0	0	0	0	0	0	3
Hindle et al., 2014	7	1	0	0	0	0	0	0	1	0	6	0	6	0
Filardo et al., 2014	4	0	0	0	0	4	0	0	0	0	0	0	0	0
Miller et al., 2015	8	0	0	0	0	8	0	0	0	0	0	0	8	0
Ronga et al., 2015	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clavé et al., 2016	6	0	0	0	0	0	1	2	1	1	1	0	0	0
Erol et al., 2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zellner et al., 2017	4	0	0	0	4	4	4	2	0	0	0	3	4	0
Solheim et al., 2017	4	2	1	0	0	0	0	0	0	0	0	0	1	0
Carey et al., 2019	10	0	0	0	0	0	0	0	0	0	0	0	10	0

DISCUSSION

OCA transplantation is usually performed as a salvage procedure in cases of failed previous cartilage repair or as a primary cartilage repair technique for large osteochondral lesions on the knee, with good and excellent outcomes *(Gracitelli et al., 2015)*. Osteochondritis dissecans (OCD) is a disorder resulting in focal breakdown of the subchondral bone, with potential disruption of the overlying articular cartilage *(Eismann et al., 2014)*.

We found that the mean age of the included patients was 32 years, Median was 31.85 years, Minimum- Maximum 21.2-40.8, and 69.5% of included cases were females.

Quarch et al. (2014) was conducted on 37 patients by removing the osteochondral cylinders from the dorsal medial femoral condyle of the affected knee joint, the study group's average age was 38.3 (±10.9) years; in the control group, the average age was 39.7 (±10.7) years.

In a systematic review of *Andrade et al. (2016)* reported that a total of 1726 patients (1472 and 254 patients underwent knee and ankle mosaicplasty, respectively) with a mean age of 33.2 years and 34.8 years old for the knee and ankle joints cohorts, respectively.

In a prospective randomized study of *Ulstein et al. (2014)*, Twenty-five patients [mean age 32.3 years, standard deviation (SD) 7.7] were enrolled in the study between November 2000 and June 2006 to compare long-term functional and radiological outcome following MF and OAT mosaicplasty for full-thickness chondral lesions of the knee.

In this sense, orthopedic surgeons have pursuit in the past an approach that can allow achieving the hyaline or hyaline-like repair of articular defects *(Andrade et al., 2016)*.

The present study revealed that the mean defect size from the 14 participant studies was 4.2 (cm2), median was 3.8, Minimum- Maximum 3- 6.1.

In the study of *Zellner et al. (2017)*; the 46 patients had 47 deep, large osteochondral defects of the knee joint (1 patient with bilateral defects; mean defect size, 6.7 cm2). The origin of the osteochondral defects was osteochondritis dissecans (n = 34), osteonecrosis (n = 8), or subchondral cysts (n = 5). Depending on the depth, all defects were treated by cancellous bone grafting (defect depth 10 mm; n = 16) or bone block augmentation (defect depth 0.10 mm; n = 31) combined with MACT.

Richter et al. (2016) discussed the treatment of osteochondral lesions of the knee, lesions with dimensions < 2 cm2 and found that the best treated through micro-fracture (first-line option) or OTA.

The latter shows more longevity and durability of results, especially among high functional demand patients, when compared with micro-fractures *(Krych et al., 2012)*.

As regard outcome, in the current reviews; we found that the commonest score used to assess outcome was KOOS which used in 5 studies and showed improvement after treatment, IKDC scores appeared in 4 studies preoperative and postoperative values shows significant increase postoperative, HSS appeared in one study, *Tı´rico et al. (2018)* reported that Postoperative IKDC pain, function, and total scores differed between patients who were satisfied and not satisfied. All KOOS subscale results differed between those who were satisfied and not satisfied. PRO difference scores (change from pre-surgery to follow-up) varied between satisfied and not-satisfied patients. The mean changes in IKDC pain, function, and total scores were 23.0, 4.1, and 31.9 for satisfied patients and 20.8, 1.3, and 8.3 for patients who were not satisfied, respectively. The mean changes in KOOS subscale results for satisfied and not-satisfied patients were 22.8 and 7.4 (symptoms), 23.9 and 7.4 (pain), 21.2 and 7.7 (activities of daily living), 35.4 and 10.9 (function in sports and recreation), and 37.7 and 11.0 (quality of life), respectively.

Although good results are being reported in the scientific literature regarding the mosaicplasty procedures, there is still the need to bear in mind the potential donor-site morbidity arising

from the osteochondral plugs harvesting *(Andrade et al., 2016)*.

As regard complications, the current metanalysis demonstrated that 54 cases showed complications graft failure founded among 16 cases and 34 needs reoperations, *Ulstein et al. (2014)* reported that 5 cases were reoperated, *Hindle et al. (2014)* revealed that 6 cases were reoperated, 8 cases in *Miller et al. (2015)*, and 10 cases in *Carey et al. (2019)*.

Reports of filling the donor holes with biocompatible material have been published *(Bartha et al. 2013)*, aiming to reduce the donor-site morbidity after the osteochondral harvesting. Nevertheless, the best approach may be to preserve the weight-bearing areas of the knee joint and harvest the osteochondral plugs from potential morbidity-free, minimal non-weight-bearing areas. In this sense, several alternative donor-site areas for mosaicplasty harvesting have been proposed. While the posterior femoral condyles and the calcaneal tuberosity cartilage were considered as unsuitable donor-site alternatives for osteochondral autografting *(Thaunat and Beaufils, 2010* and *Calder et al., 2015)*, the lower weight-bearing area of the patellofemoral joint and the upper tibio-fibular joint showed promising results in humans without donor-site morbidity associated *(Espregueira-Mendes et al., 2012)*.

Sepsis was reported in 1 of 142 patients in a case series of *Ollat et al. (2011)* in which patients had OATM, at 8-year follow-up.

Infection was statistically significantly more frequent in the weight-bearing as tolerated group (2 of 437 patients) than in the non-weight-bearing groups (0 patients) in the case series of *Kosiur and Collins, (2014)*; which was conducted on 534 patients who had OATM at 32 to 39-month follow-up.

CONCLUSION

In conclusion, on the basis of the good clinical and MRA results obtained at long-term follow-up, mosaicplasty can be considered a safe and reliable option for the treatment of unstable OCD in adult patients. The biological and mechanical principles of this procedure allow treating these complex lesions in a simple way preserving the OCD fragments.

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دراسة منهجية لاستعراض استخدام زرع الرقع العظم غضروفية الذاتية في علاج الالتهاب الغضروف العظمي السالخ

حسن محمد حسن، محمد محمد بيصار، عماد محمد زايد

قسم جراحة العظام، كلية طب الأزهر

E-mail: dr.hassan90@hotmail.com

خلفية البحث: التهاب الغضروف العظمي السالخ هي عبارة عن حالة موضعية تتميز بانفصال جزء من الغضروف العظمي من محيطه الطبيعي مما يتسبب في حدوث ألم وتورم بالركبة وقد ينتج عنه سقوط أجزاء حرة داخل المفصل ويؤثر على حركته.

الهدف من البحث: مراجعة ما هو متاح حاليا من مؤلفات عن استخدام الترقيع الغضروف العظمي الذاتي في علاج التهاب الغضروف العظمي السالخ بمفصل الركبة من خلال النتائج والمضاعفات.

المرضى وطرق البحث: تم تضمين 14 دراسة كانت الدراسات المستقبلية هي النوع الأكثر شيوعًا الذي ظهر في 6 دراسات متبوعة بسلسلة حالة في 4 دراسات، واستعادة الأثر في 3 دراسات وتجربة معشاة ذات شواهد في دراسة واحدة.

كان العدد الإجمالي للمرضى المتضمنين 328 مريضًا بمتوسط فترة متابعة 96.7 شهرًا، ومتوسط 95.4 شهرًا والحد الأدنى- الحد الأقصى 6-217.2.

نتائج البحث: كشفت النتائج الرئيسية للدراسة أن متوسط عمر المرضى المشمولين 32 عامًا، وكان المتوسط 31.85 عامًا، والحد الأدنى- الحد الأقصى 21.2-40.8، و(228 69.5٪) من الحالات المشمولة كانت من الإناث.

كان متوسط حجم العيب 4.2 (سم 2)، وكان المتوسط 3.8، الحد الأدنى- الحد الأقصى 3- 6.1.

كانت النتيجة الأكثر شيوعًا المستخدمة لتقييم النتيجة KOOS التي استخدمت في 5 دراسات وتظهر تحسنًا بعد العلاج، وظهرت درجات IKDC في 4 دراسات قبل الجراحة وقيم ما بعد الجراحة تظهر زيادة كبيرة بعد الجراحة، ظهر HSS في دراسة واحدة. وقد أظهرت 54 حالة مضاعفات فشل الترقيع بين 16 حالة و 34 حالة تحتاج إلى إعادة فتح.

الإستنتاج: بناءً على نتائجنا تبين أن استخدام الرقع العظم غضروفية ناجح وذو نتائج جيدة في علاج الالتهاب الغضروف العظمي السالخ، ونوصي بإجراء مزيد من الدراسات للمرضى الأكبر وفترة متابعة أطول للتأكيد على استنتاجنا.

الكلمات الدالة: الالتهاب الغضروف العظمي السالخ، المضاعفات، مراجعة منهجية، العلاج، معدل تقييم IKDC.