Microfracture Arthroscopy Efficacy In Treatment Of Articular Cartilage Insult Of Knee

Mohamed Baqir Alshara *, Mohammed Shihab Ahmed **

ABSTRACT
Background: The treatment of articular cartilage defects is one of the most clinical challenges for orthopedic surgeons. Articular cartilage is a highly organized tissue with complex biomechanical properties and substantial durability. However, it has a poor ability for healing, and damage from trauma or degeneration can result in morbidity and functional impairment. Debilitating joint pain, dysfunction, and degenerative arthritis are common outcomes.

Objectives: The purpose of the study is to show the effectiveness of microfracture arthroscopy as a method of treatment for such problems.

Type of the study: Cross-sectional study.

Methods: Arthroscopic surgery was done to 52 patients who complain of knee pain limping and show clinical or radiological evidence of cartilaginous injury. We used arthroscopic microfracture technique for those patients who have injury of no more than 4cm² then we instruct patient to not put any weight over knee for 2-3 months and followed clinically according to Lysholm score and by MRI and some of them by second look arthroscopy to assess the healing.

Results: Fifty two patients under went micro fracture arthroscopy. Thirty four patients (65.4%) reported good or excellent subjective results, thirteen patients (25%) had fair knee function, and only five patients (9.6%) reported poor result.

Conclusions: Micro fracture arthroscopy is a cheap and effective method for repairing cartilaginous lesion.

key words: micro fracture, arthroscopy, and articular cartilage.

Al-Kindy College Medical Journal 2018: Vol. 14 No. 1
Page: 24-28

*Orthopedic Surgeon Ficms Ortho Md
** Asst. Prof. Orthopedic Surgeon In Al-Kindy College Of Medicine. Ficms Ortho Md

Received 10th January 2017, accepted in final 30th April 2017
Corresponding to: Mohammed Shihab Ahmed

Articular cartilage is a highly organized tissue with complex biomechanical properties and substantial durability. However, it has a poor ability for healing, and damage from trauma or degeneration can result in morbidity and functional impairment. Debilitating joint pain, dysfunction, and degenerative arthritis are common outcomes.

Chronic articular cartilage defects don't heal spontaneously. Reparative fibrocartilage comprises of type-I, type-II, Also type-III collagen on changing sums. Those fibro cartilage doesn't look like the encompassing hyaline cartilage. Dissimilar to different cartilage rebuilding techniques, bone marrow incitement doesn't include exchange for chondrocytes under those lese greatness making a contained lesion will be basic with accomplishing an stable base to filling the deformity with an clot and bond of the clot.

Assuming that the lese greatness will be not shouldered toward an stable edge for sound cartilage, accomplishing a stable clot might make additional was troublesome. Those calcified cartilage layer in the base of the lese greatness must have a chance to be removed too. Evacuation of this layer will be essential for cluster bond and the ultimate prosperity of the microfracture method. The readied channels must have a chance to be of addition profundity to guarantee infiltration of the subchondral plate what's more correspondence for those marrow.
Methods
A fifty two patient complaint of knee pain, swelling and catching treated by microfracture arthroscopic technique surgery in Al-Shaheed Alsader and al-Muktar private hospitals and they followed for twenty four months by clinical assessment (Lysholm knee scoring scale) [4], MRI

![Fig 1: MRI picture of femoral condylar cartilaginous lesion](image1)

![Fig2: MRI picture of femoral osteocondylar cartilaginous lesion](image2)

and second look arthroscopy but not all patient because some of them refuse another surgery so about half of patient agreed for second look arthroscopy At two years all patient had been followed except seven patients had removed, were pregnant, or were not available for examination in the outpatient clinic. However, these patient (none of whom had a failure) were contacted by telephone, and they returned their questionnaires.

Inclusion criteria
1. Optimal patient age should be less than forty-five years ranged from 10 to 45 years.
2. Symptomatic, central chondral lesions of the weight bearing femoral condyles,
3. The ideal knee lesion should be isolated, well contained, and not exceed an area of 4 cm² (2 × 2 cm)

Exclusion criteria
1. Generalized degenerative joint changes
2. Uncontained chondral lesions.
3. Extreme pivotal malalignment for >5° to lesions of the femoral condyle (surgical realignment required).
4. Patella maltracking or precariousness for patellofemoral lesions
5. Tumor
6. Infection.
7. Body-mass >30.

Tegner Lysholm Knee Scoring Scale [4]

| Section 1 - Limp | Section 2 - Support |
|------------------|---------------------|
| ![None](image3) | ![None](image4) |
| ![Slight or periodical](image5) | ![Stick or crutch](image6) |
| ![Severe and constant](image7) | ![Weight-bearing impossible](image8) |

During the past 4 weeks
Section 3 - Pain

- None
- Inconstant and slight during severe exertion
- Marked during severe exertion
- Marked on or after walking more than 2 km
- Marked on or after walking less than 2 km
- Constant

Section 4 - Instability

- Never giving way
- Rarely during athletics or other severe exertion
- Frequently during athletics or other severe exertion
- Occasionally in daily activities
- Often in daily activities
- Every step

Section 5 - Locking

- No locking and no catching sensations
- Catching sensation but no locking
- Locking occasionally
- Frequently
- Locked joint on examination

Section 6 - Swelling

- None
- On severe exertion
- On ordinary exertion
- Constant

Section 7 - Stair-climbing

- No problems
- Slightly impaired
- One step at a time
- Impossible

Section 8 - Squatting

- No problems
- Slightly impaired
- Not beyond 90°
- Impossible

Grading the Tegner Lysholm Knee Scoring Scale

| Score | Grade     |
|-------|-----------|
| <65   | Poor      |
| 65-83 | Fair      |
| 84-90 | Good      |
| >90   | Excellent |

Tab. 1: Tegner Lysholm scoring Scale

Surgical procedure

All of the patients treated by microfracture arthroscopic technique under general anesthesia and tourniquet applied. The marrow-stimulation technique required bed preparation by using a curette or a full-radius shaver blade to remove any remaining fragment of articular cartilage. Loose fragment should also be removed at the lesion's margin and vertical wall of well-attached healthy cartilage should be created. The subchondral plate should not be penetrated but the calcified cartilage layer above it removed with curette. Multiple penetrating holes are placed 3 to 4 mm apart throughout the bed of lesion fig 4, 5, 6. After surgery we put back slab above knee for next two weeks and stitches removal after ten days, we follow the patients clinically by using Lysholm knee scoring scale, MRI and second look arthroscopic procedure in some patients.

Fig 4: After debridment of edges of lesion

Fig 5: The lesion then penetration of subcondylar bone

Fig. 6: Illustrating the systematic spiral pattern of microfracture penetrations of the subchondral bone plate throughout the cartilage lesion, allowing for a homogeneous distribution of the microfractures while...
maintaining sufficient subchondral bone bridges between individual penetrations

**Results:** Fifty-two symptomatic patients with a full-thickness articular cartilage defects of the femur in a stable knee were treated with the microfracture technique. Prospective evaluation of patient outcome was performed for a minimum follow-up of twenty four months with a combination of subjective clinical examination and assessment, magnetic resonance imaging and second look arthroscopic examination. There were 29 women (55.8%) and 23 men (44.2%) with average of 25 - 55 years old and 29 (55.8%) of them were with cartilaginous lesion due to trauma 11 (21.2%) of them due to degenerative, four of patients (7.7%) due to foreign body inside the knee and eight patients(15.4%) due to patellofemoral overload syndrome tab. 1. The traumatic in 33 patients (63.5%) and non traumatic in 19 patients (36.5%). All of our patient not gone through surgery before our procedure but having different kinds of medical treatment and intra articular injection without benefit . The preoperative duration of symptoms range(12 to 48 months). The mean body-mass index was 26 ± 3 kg/m2 (range 20 to 29 kg/m2). The lesion size averaged 380 mm2 (range, 200 to 290 mm2). The lesions were located on the medial femoral condyle in 27 of patients (51.9%), thirteen patients in lateral femoral condyle (25%), and 12 patients in trochlea (23.1%), tab. 2Forty two patients (80.8 %) the defects were chondral lesions, while the remaining ten patients (19.2%) were osteochondral lesions without cavitation.

**Tab 1 :** The causes of articular cartilage insult

| Causes                  | No. of patient | %    |
|-------------------------|----------------|------|
| Trauma                  | 29             | 55.8 |
| Degenerative disease    | 11             | 21.2 |
| Foreign body            | 3              | 5.8  |
| Patello-femoral overlap | 8              | 15.4 |

**Tab 2 :** The site of the lesion

| Site                     | No. of patients | %    |
|--------------------------|-----------------|------|
| Medial femoral condyle   | 27              | 51.9 |
| Lateral femoral condyle  | 13              | 25   |
| Trochlea                 | 12              | 23.1 |

**Tab 3 :** Clinical outcome according to Lysholm score

| Outcome                  | No. of patients | %    |
|--------------------------|-----------------|------|
| Good to excellent        | 34              | 65.4 |
| Fair                     | 13              | 25   |
| Poor                     | 5               | 9.8  |

At the time of the two-years follow-up, there were five patients failure (8%) they retain some pain and intermittent swelling and they asked to do second look arthroscopic surgery they refused except two of them. one of those patient had a good reasonable healing but developed another lesion in other site and other one need more time for healing for second look arthroscopy after three months from original first surgery. Thirteen patients (25%) had fair knee function, and only five patients (8%) reported poor result.tab 3. Daily activities after micro fracture arthroscopy had increased according to lysholm scoring system. Magnetic resonance imaging demonstrated a hyperintense signal in the repair cartilage in thirty-seven (71.1%) of patients and mild subchondral edema in fifteen patients (28.1%). Repair cartilage fill was graded as good in the majority of patients, but most treated lesions demonstrated depressed repair cartilage morphology relative to the adjacent hyaline cartilage .fig 7&8.

![Fig 7&8 thirty-three-year-old woman who had a fullthickness articular cartilage defect of the medial femoral condyle before and after microfracture arthroscopy](image)

**Discussion:** This study demonstrated about how the microfracture chondroplasty can resulted in increased functional scores in patients treated for symptomatic cartilage lesion at follow-up of two years

In the long-term study by Steadman et al (7), which involved a cohort of seventy-one knees treated with microfracture chondroplasty, the mean Lysholm score improved from 59 before surgery during of follow-up12 months to 82 score. The greatest improvement occurred in the first year after surgery, but improvement continued for two to three years postoperatively. In contrast, other studies of microfracture have shown deterioration of results over time (3,4,5). Also Steadman et al(7) reported that their patients had substantial increases in the ability to perform the activities of daily living, strenuous work, and sports after microfracture. The over all result in our study is parallel to other studies both clinical (lysholm score) (7,11,12, 13) and second look arthroscopic surgery as if we compare to other studies (7,13) there is a good functional result about 85% -90% after 8 weeks non
weight bearing and follow up of 2 years when patient experienced maximum improvement that’s probably because of increasing cartilage lay down over time. The preoperative duration of symptoms was found to be an important factor for cartilage repair with microfracture chondoplasty in our study, as significantly patients with preoperative time of more than six months showed improved activities of daily living scores. Similarly, prolonged preoperative intervals mostly more than six months also have been associated with an inferior grade of repair cartilage at second-look arthroscopy after microfracture. Previous studies shown relation between age and result of microfracture as they shown there is a good result in patient under age of thirty. In our study we observed such finding that the clinical outcome and the healing that was observed by second look arthroscopy for patient who did so probably because of age depending healing capacity of cartilage which related to difference in metabolic rate however we cannot confirm because we have no solid statistical studies about how much age related to cartilage healing. Body-mass index was inversely correlated with the activities of daily living score. Patients with a body-mass index of >30 kg/m² demonstrated the lowest outcome scores and the worst subjective rating. Osseous overgrowth following microfracture has not been well described and was observed in 5% of the patients who did magnetic resonance imaging post operative in our study. This phenomenon is thought to result from metaplasia of the deep layer of the repair cartilage after microfracture stimulation and has been demonstrated in up to 49% of patients after microfracturein the knee. The factors responsible for the development of osseous overgrowth still not been figured out, but excess breaching of the subchondral bone plate during drilling or shaving of the calcified cartilage layer may promote vascularization of the base of the repair tissue and provide a stimulus for endochondral ossification. The problem facing this study was absence of control study and weak compliance of patient for follow up and for second look arthroscopy in spite of that we were able to demonstrate significant changes in knee function and were able to identify several factors that influence functional outcome after microfracture by using instruments that have been previously validated for the knee. We routinely asked for second look arthroscopy because we have no cartilage sensitive magnetic resonance imaging which provides reliable information about repair cartilage filling and integration with additional evaluation of the underlying subchondral bone plate with respect to integrity and overgrowth. 

References
1. Hunter W (1743) "On the structure and diseases of articulating cartilages." Trans R Soc Lond 42B:514-21
2. Curl WW, Krome J, Gordon ES, Rushing J, Smith BP, Poehling GG. Cartilage injuries:a review of 31,516 knee arthroscopies. Arthroscopy. 1997;13:456-60.
3. Gobbi A, Nunag P, Malinowski K. Treatment of full thickness chondral lesions of the knee with microfracture in a group of athletes. Knee Surg Sports Traumatol Arthosc. 2005;13:213-21.
4. Mitchoer K, Williams RJ 3rd, Warren RF, Potter HG, Spock CR, Jones EC,Wickiewicz TL, Marx RG. The microfracture technique for the treatment of articular cartilage lesions in the knee. A prospective cohort study. J Bone Joint Surg Am. 2005;87:1911-20
5. Gudas R, Stankevicius E, Monastyreckiene E, Pranys D, Kalesinskas RJ. Osteochondral autologous transplantation versus microfracture for the treatment of articular cartilage defects in the knee joint in athletes. Knee Surg Sports Traumatol Arthosc. 2006;14:834-42
6. Knutsen G, Engebretsen L, Ludvigsen TC, Droset JO, Grontvedt T, Solheim E,Strand T, Roberts S, Isaksen V, Johansen O. Autologous chondrocyte implantation compared with microfracture in the knee. A randomized trial. J Bone Joint Surg Am. 2004;86:455-64.
7. Steadman JR, Rodkey WG, Singleton SB, Briggs KK. Microfracture technique for full-thickness chondral defects. Technique and clinical results. Oper Tech Orthop. 1997;7:300-4.
8. Gobbi A, Nunag P, Malinowski K. Treatment of full thickness chondral lesions of the knee with microfracture in a group of athletes. Knee Surg Sports Traumatol Arthosc. 2005;13:213-21.
9. Blevins FT, Steadman JR, Rodrigo JJ, Silliman J. Treatment of articular cartilage defects in athletes: an analysis of functional outcome and lesion appearance. Orthopedics. 1998;21:761-8.
10. Steadman JR, Briggs KK, Rodrigo JJ, Kocher MS, Gill TJ, Rodkey WG. Outcomes of microfracture for traumatic chondral defects of the knee: average 11-year follow-up. Arthroscopy. 2003;19:477-84.
11. Frisbie DD, Oxford JT, Southwood L, Trotter GW, Rodkey WG, Steadman JR, Goodnight JL, McIwrath CW. Early events in cartilage repair after subchondral bone microfracture. Clin Orthop Relat Res. 2003;407:215-27.
12. Blevins FT, Steadman JR, Rodrigo JJ, Silliman J. Treatment of articular cartilage defects in athletes: an analysis of functional outcome and lesion appearance. Orthopedics. 1998;21:761-8.
13. Mitchoer K, Williams RJ 3rd, Warren RF, Potter HG, Spock CR, Jones EC, Wickiewicz TL, Marx RG. The microfracture technique for the treatment of articular cartilage lesions in the knee. A prospective cohort study. J Bone Joint Surg Am. 2005;87:1911-20
14. Brown WE, Potter HG, Marx RG, Wickiewicz TL, Warren RF. Magnetic resonance imaging appearance of cartilage repair in the knee. Clin Orthop Relat Res.2004;422:214-23
15. Piasceki DP, Spindler KP, Warren TA, Andrish JT, Parker RD. Intraarticular injuries associated with anterior cruciate ligament tear: findings at ligament reconstruction in high school and recreational athletes. An analysis of sex-based differences. Am J Sports Med. 2003;31:601-5