Surgical Fixation of Chondral-Only Fragments: A Systematic Review

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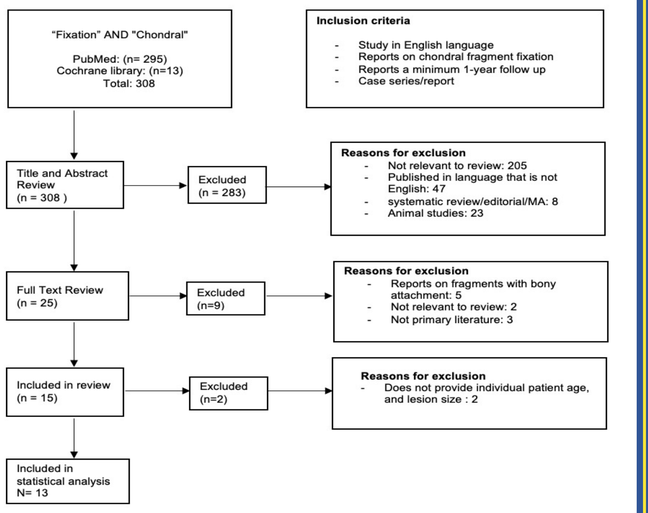
Background

- Chondral-only fragments are cartilage lesions without osseous attachments that typically occur in weight-bearing joints like the knee. While osteochondral fragments consist of both cartilage and bone.
- Most cartilage lesions are osteochondral, while the minority produce chondral only defects. Our review will focus on chondral-only defects.
- There is currently controversy in literature about the optimal treatment for purely chondral fragments.
- Chondral lesions have for a long time been a challenging clinical problem for the orthopedic surgeons, particularly when the lesion is in weight-bearing joints such as the knee.
- Both kinds of cartilage lesions are common in the adolescent patient population and can lead to arthralgia, functional impairment, and degenerative osteoarthritis.[2].
- Common surgical procedures for osteochondral fragments have included reduction and fixation using biodegradable pins or sutures.[3] which has shown positive results[4, 5, 6] .
- Chondral-only fragments have traditionally been removed and followed up with other restorative procedures due to their avascular nature and poor ability to heal to bone.
- There have been several recent case reports demonstrating successful healing of chondral fragments to bone.[9-23]
- The purpose of this study is to gather the current literature on surgical fixation of chondral fragments and explore whether it is a feasible and reliable tool for acute chondral-only fragments in adolescent and/or adult patients.

Methods



Results

Demographics

- 76 patients were identified in the review, but individual data was not reported on 30 patients in the review.
- Of the 46 patients whose individual patient data were accessible 82% were male.
- The mean age was 15.1, (range 10-30).
- Mean clinical follow up was 46.7 months (range 3-171).
- The mean fragment size was 3.87 cm2 (range 0.8cm2 to 10.5 cm2).
- The locations of the lesion were found in the trochlea(32%), patella (22%), and lateral (28%) and medial (17%) femoral condyles.
- Mean time to surgery ranged from 6 to 70 days between all studies.

Table 2: Follow up data and fixation methods

First author, year of publication	n(patients)	Time Return to Sport	Mean follow up (months)	Post op confirmation method (arthroscopy/MRI/Histology)	Post op confirmation Time	Fixation Methods	Survival rate of fragment(%)
Anderson, 2013	5	mean 4.6 years	55.2	MRI	Mean 3.1 yrs	Compression screws	80%
Beckert, 2020	1	6 mo	31	MRI and Arthroscopy	M-1.5 yrs A-1.9 yrs	Bioabsorbable pins	100%
Chan, 2014	1	NR	NR	MRI and Arthroscopy	Both 11.5 months	Bioabsorbale sutures	100%
Churchill, 2019	10	NR	56	MRI	5 mo (3.5-6mo)	bioabsorbable chondral darts, compression screws, SmartNails, metallic compression screws	100%
Fabricant, 2018	15	NR	~ median 12	MRI	Median 12.0 mo	Bioabsorbale tacks, screws, sutures, sutures plus anchors	86%
Gudeman, 2021	15	Median 26.0 wks	47.52	MRI	24 mo	Screws, sutures, screws plus sutures	80%
Jeuken, 2019	3	>3 months	12 months	MRI	12 mo	Fibrin glue + suture	100%
Kjennvold, 2020	10	median 9 mo	61.2	MRI	range 2-9 years	Bioabsorbable meniscus arrows	100%
Morris, 2016	1	1 yr	12	MRI	3 mo	Bioabsorbable pins	100%
Nakamura, 2004	1	2 yrs	33	MRI and Arthroscopy	M- 2yrs 9 mo A- 6mo H- 6mo	Bioabsorbale pins	100%
Nakayama, 2014	1	7 mo	26	MRI and Arthroscopy	M- 4 mo A- 1yr	Bone pegs	100%
Noh, 2012	1	NR	21	MRI, Arthroscopy and Histological	M- 21 mo A-21 H-21	5-0 prolene suture	100%
Ogura, 2020	6	7 months (6-8 mo)	62.4	MRI	3 yrs (1-5 yrs)	Bone pegs	83%
Siparsky, 2017	3	NR	16	MRI and Arthroscopy	M-36 mo A- 8 mo	Chondral darts and biologic adhesive	100%
Uchida, 2012	3	7 mo-24 mo) 1 patient NR	24	MRI	2 yr	Bioabsorbable pins	100%

Limitations

- Inconsistent reporting between all papers.
- 1 year minimum clinical follow up was used to ensure the study had a substantial size, which could further skew results.
- Functional outcome scores were only documented in 5/15 articles in the study.
- Potential selection bias by reviewers

Conclusion

Cartilage defects continue to be a clinical challenge for the orthopedic surgeon. In this review we compare 15 articles with a total of 76 patients. 70 of those 76 patients showed success of the chondral-only fragment to fixate to bone by postoperative MRI, arthroscopy and/or histological confirmation. Based on these numbers, the current literature is promising for this approach to acute chondral fractures. However, there is still a paucity of data on fixation of chondral defects. Further prospective, comparative studies are necessary to properly evaluate the relative efficacy of this technique to current traditional methods and within the various modalities of chondral fixation.

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