Clinical efficacy of the microfracture technique for articular cartilage repair in the knee: an evidence-based systematic analysis

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CRD summary
The review found that microfracture for articular cartilage repair of the knee improved short-term function. More evidence was needed about long-term outcomes and specific indications for microfracture. Due to differences between studies and a lack of statistical data in the review, the authors’ conclusions may not be reliable.

Authors’ objectives
To evaluate the clinical efficacy of microfracture for articular cartilage repair of the knee.

Searching
MEDLINE, PREMEDLINE, EMBASE, CINAHL, Life Science Citations and National Library for Health, including Cochrane Central Register of Controlled Trials (CENTRAL) were searched from 1966 to October 2007 for published and unpublished studies. Search terms were reported. Reference lists of relevant studies and reviews were checked. The search was limited to studies in English or German.

Study selection
Prospective or retrospective controlled or uncontrolled studies that reported clinical outcomes after microfracture to repair International Cartilage Society Grade III or IV chondral or osteochondral defects of the knee (femoral condyle, tibia or patellofemoral joint) were eligible for inclusion. Microfracture could be combined with other surgery or additional procedures. Non-randomised studies were required to report magnetic resonance imaging (MRI) of cartilage repair, second-look or histological findings after at least one year’s follow-up or clinical outcomes at at least two years’ follow up. Studies of osteochondral defects or with less than 70% follow-up were excluded.

The studies in the review included populations with a variety of lesion types, cointerventions, degrees of joint degeneration and age. Reporting of participant characteristic was suboptimal in many studies. Mean participant age ranged from 24 to 65 years. Most participants had acute single chondral defects and a mean lesion size of under 4cm. Most studies included both femorotibial and patellofemoral defects. Many participants received microfracture plus a cointervention such as meniscal surgery. Most studies described detailed rehabilitation procedures, which often included continuous passive motion exercises. Outcome measures varied widely and included 15 different functional scales. Review outcomes included complications, adverse effects, failures (defined in the review as failure to improve clinically or need for revision surgery) and factors that affected functional outcomes. Mean study follow-up was 41 months; nearly half of the participants had over five years’ follow-up.

Two reviewers independently selected studies.

Assessment of study quality
A modified published scale (Coleman Methodology Score) was used to allocate up to 100 points for quality components that included sample size, follow-up, design, diagnostic certainty, reporting of selection and clinical procedures, and outcomes evaluation. Levels of evidence were allocated, ranked by study design.

Two reviewers independently assessed study validity. Disagreements were resolved by discussion.

Data extraction
Descriptive data were extracted from each study by two reviewers who worked independently. Disagreements were resolved by discussion.

Methods of synthesis
Studies were combined by narrative synthesis, organised by type of outcome.

**Results of the review**

Twenty-eight studies were included (n=3,122, range seven to 1,200): six RCTs; one prospective cohort; and 21 case series (12 prospective and nine retrospective). Overall validity was acceptable. Mean quality score was 58.2 points out of 100 (range 22 to 97). Scores were relatively high (at least 80%) for diagnostic certainty, follow-up rate and description of outcomes. Scores were relatively low for study design, methods of selection and outcomes assessment.

All relevant studies (24 out of 24) reported improved knee function after microfracture with greatest improvement in the first 24 months. Among five studies (one RCT and four case series) that reported clinical results at least five years after microfracture, 67% to 87% of participants reported improvement.

Defect fill rates in MRI studies (two RCTs and seven case series) were inconsistent, but fill rates correlated positively with functional outcomes (three studies). Studies of second-look arthroscopy (three RCTs and six case series) found normal or near-normal macroscopic cartilage repair grading in 45% to 77% of defects at eight to 24 months’ follow-up. In studies with histological data (n=six), fibrocartilage alone was found in 33% to 57% of cases and hybrid fibrohyaline cartilage in 39% to 64%.

Complications and procedure-related adverse events were rare. Failure rates were variable and time-dependent: in RCTs, the revision rate was 23% to 31% at two- to five-year follow-up.

Other results were reported in the review; these included a summary of factors associated with functional outcomes of microfracture.

**Authors’ conclusions**

Microfracture for articular cartilage repair of the knee improved short-term function. More evidence was needed about long-term outcomes and specific indications for microfracture.

**CRD commentary**

Review objectives and inclusion criteria were clear. Relevant sources were searched for published and unpublished studies. The language restriction made the review prone to language bias. Steps were taken to minimise risks of reviewer bias and error by having more than one reviewer independently select studies, assess validity and extract data. Little information was provided about individual studies (such as sample numbers, quality score, control conditions and effect sizes). The decision to combine data by narrative synthesis appeared appropriate given the heterogeneity between studies. The better-quality evidence was highlighted in the interpretation of findings. However, the failure to report any statistical data on effect sizes made it hard to evaluate the clinical significance of the findings reported. The authors’ conclusions may not be reliable due to differences between studies and lack of statistical data in the review.

**Implications of the review for practice and research**

**Practice:** The authors stated that microfracture for repair of knee cartilage defects was safe and effective for improving short-term function. Drawbacks included limited hyaline repair tissue, variable repair cartilage volume and potential deterioration over time.

**Research:** The authors stated that more research was required on a number of topics with respect to microfracture: specific indications; risk factors for functional deterioration; optimisation of benefits; determinants of cartilage fill grade and histological quality; pathophysiology and clinical effects of subchondral overgrowth; postoperative rehabilitation protocols; reliability and responsiveness of knee outcome scores; and treatment of specific isolated defects (especially isolated patellofemoral cartilage lesions). A consistent definition of failure was required.

**Bibliographic details**

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.