

Subchondroplasty procedure for bone marrow lesions in patients with knee osteoarthritis: clinical and radiological findings up to 24 months of follow-up

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INTRODUCTION: Bone marrow edema, or bone marrow lesion (BML), is a finding visible on magnetic resonance imaging (MRI) in fat-suppressed sequences (T2FS, PDFS), appearing as a blurred white area within darker surrounding bone. It reflects a bone healing attempt, likely in response to trauma such as microtrabecular fractures of the subchondral bone. Although bone marrow edema is now clearly associated with knee pain, its impact on symptoms and knee function has only been recognized in recent years. Therapeutic options for chronic BMLs were previously limited to core decompression, shockwave therapy, or pharmacological treatments.

Subchondroplasty (SCP) using AccuFill is a procedure for the treatment of bone marrow edema based on the intraosseous injection of a calcium phosphate bone substitute. Thanks to its osteoconductive properties, the material is resorbed and replaced by new bone during the healing process. While efficacy data are promising, prospective clinical studies are needed to evaluate the long-term effectiveness and safety of the procedure.

METHODS: A prospective, multicenter, longitudinal study was conducted on 95 patients with knee osteoarthritis and concomitant BML, treated with SCP. Patients included had persistent BML of the femoral condyle or tibial plateau (≥ 3 months), unresponsive to conservative treatments. Follow-up evaluations were conducted at 1, 3, 6, 12, and 24 months. All patients completed the NRS, KOOS, EQ-5D, global patient satisfaction scale, and questionnaires on healthcare resource utilization. The aim of the study was to assess the effectiveness of SCP through symptomatic, radiographic, and functional scores at each follow-up point.

RESULTS:

Analysis was performed on the first 73 patients who completed the 24-month follow-up. The mean age was 54 years; 57.61% were male. No severe adverse events were reported. The NRS showed a mean reduction of 49.7% at 24 months compared to baseline. Statistically significant improvements were observed in all KOOS subscales from baseline (Pain: 45.9 ± 14.3 ; Symptoms: 58.3 ± 18.2 ; Sports: 16.8 ± 15.5 ; ADL: 53.6 ± 18.8 ; QOL: 28.7 ± 15.3) to 24-month follow-up (Pain: 81.3 ± 18.1 ; Symptoms: 81.5 ± 20.4 ; Sports: 51.5 ± 32.7 ; ADL: 83.2 ± 17.5 ; QOL: 62.0 ± 27.0).

Overall, 73.6% of patients reported that the treatment goal had been achieved. No statistically significant correlation was found between KOOS outcomes and age, sex, or Kellgren-Lawrence grade of osteoarthritis, suggesting that SCP efficacy may be independent of these variables. Preliminary analyses of patients reaching the 36-month follow-up seem to confirm these findings. MOAKS scoring on MRIs showed a statistically significant improvement in bone marrow edema at 12 months ($p=0.04$).

DISCUSSION AND CONCLUSION:

These findings support the use of SCP as a safe and effective minimally invasive approach for managing symptomatic bone marrow lesions in patients with knee osteoarthritis. The significant improvements in pain, function, and quality of life sustained over 24 months highlight the potential of SCP to fill the therapeutic gap between conservative management and joint replacement. The lack of correlation between outcomes and demographic or radiographic variables suggests broad applicability across patient subgroups. Long-term studies and randomized controlled trials are warranted to confirm durability of benefits and to further define patient selection criteria. Our results suggest that SCP is an effective procedure for the symptomatic treatment of knee BMLs associated with osteoarthritis, with sustained benefits up to 24 months of follow-up. Long-term studies and randomized controlled trials are warranted to confirm durability of benefits and to further define patient selection criteria.