

Effectiveness of Dry Needling with and without Ultrasound Guidance in Patients with Knee Osteoarthritis and Patellofemoral Pain Syndrome: A Systematic Review and Meta-Analysis

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Abstract : Dry needling (DN) is one of the puncturing methods that involves the insertion of needles into the tender spots of the human body without the injection of any substance. DN has long been used to treat the patient with knee pain caused by knee osteoarthritis (KOA) and patellofemoral pain syndrome (PFPS), but the effectiveness is still inconsistent. This study aimed to conduct a systematic review and meta-analysis to assess the intervention methods and effects of DN with and without ultrasound guidance for treating pain and dysfunctions in people with KOA and PFPS. Design: This systematic review adhered to the PRISMA reporting guidelines. The registration number of the study protocol published in the PROSPERO database was CRD42021221419. Six electronic databases were searched manually through CINAHL Complete (1976-2020), Cochrane Library (1996-2020), EMBASE (1947-2020), Medline (1946-2020), PubMed (1966-2020), and Psychinfo (1806-2020) in November 2020. Randomized controlled trials (RCTs) and controlled clinical trials were included to examine the effects of DN on knee pain, including KOA and PFPS. The key concepts included were: DN, acupuncture, ultrasound guidance, KOA, and PFPS. Risk of bias assessment and qualitative analysis were conducted by two independent reviewers using the PEDro score. Results: Fourteen articles met the inclusion criteria, and eight of them were high-quality papers in accordance with the PEDro score. There were variations in the techniques of DN. These included the direction, depth of insertion, number of needles, duration of stay, needle manipulation, and the number of treatment sessions. Meta-analysis was conducted on eight articles. DN group showed positive short-term effects (from immediate after DN to less than 3 months) on pain reduction for both KOA and PFPS with the overall standardized mean difference (SMD) of -1.549 (95% CI=-0.588 to -2.511); with great heterogeneity ($P=0.002$, $I^2=96.3\%$). In subgroup analysis, DN demonstrated significant effects in pain reduction on PFPS ($p < 0.001$) that could not be found in subjects with KOA ($P=0.302$). At 3-month post-intervention, DN also induced significant pain reduction in both subjects with KOA and PFPS with an overall SMD of -0.916 (95% CI=-0.133 to -1.699, and great heterogeneity ($P=0.022$, $I^2=95.63\%$). Besides, DN induced significant short-term improvement in function with the overall SMD=6.069; 95% CI=8.595 to 3.544; with great heterogeneity ($P<0.001$, $I^2=98.56\%$) when analyzed was conducted on both KOA and PFPS groups. In subgroup analysis, only PFPS showed a positive result with SMD=6.089, $P<0.001$; while KOA showed statistically insignificant with $P=0.198$ in short-term effect. Similarly, at 3-month post-intervention, significant improvement in function after DN was found when the analysis was conducted in both groups with the overall SMD=5.840; 95% CI=9.252 to 2.428; with great heterogeneity ($P<0.001$, $I^2=99.1\%$), but only PFPS showed significant improvement in sub-group analysis ($P=0.002$, $I^2=99.1\%$). Conclusions: The application of DN in KOA and PFPS patients varies among practitioners. DN is effective in reducing pain and dysfunction at short-term and 3-month post-intervention in individuals with PFPS. To our best knowledge, no study has reported the effects of DN with ultrasound guidance on KOA and PFPS. The longer-term effects of DN on KOA and PFPS are waiting for further study.

Keywords : dry needling, knee osteoarthritis, patellofemoral pain syndrome, ultrasound guidance

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