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A Systematic Review of Efficacy and Safety of Radiofrequency Ablation in Patients with Spinal Metastases

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Abstract : Development of minimally invasive treatments in recent years provides a potential alternative to invasive surgical interventions which are of limited value to patients with spinal metastases due to short life expectancy. A systematic review was conducted to explore the efficacy and safety of radiofrequency ablation (RFA), a minimally invasive treatment in patients with spinal metastases. EMBASE, Medline and CENTRAL were searched from database inception to March 2017 for randomised controlled trials (RCTs) and non-randomised studies. Conference proceedings for ASCO and ESMO published in 2015 and 2016 were also searched. Fourteen studies were included: three prospective interventional studies, four prospective case series and seven retrospective case series. No RCTs or studies comparing RFA with another treatment were identified. RFA was followed by cement augmentation in all patients in seven studies and some patients (40-96%) in the remaining seven studies. Efficacy was assessed as pain relief in 13/14 studies with the use of a numerical rating scale (NRS) or a visual analogue scale (VAS) at various time points. Ten of the 13 studies reported a significant decrease in pain outcome, post-RFA compared to baseline. NRS scores improved significantly at 1 week (5.9 to 3.5, $p < 0.0001$; 8 to 4.3, $p < 0.02$ and 8 to 3.9, $p < 0.0001$) and this improvement was maintained at 1 month post-RFA compared to baseline (5.9 to 2.6, $p < 0.0001$; 8 to 2.9, $p < 0.0003$; 8 to 2.9, $p < 0.0001$). Similarly, VAS scores decreased significantly at 1 week (7.5 to 2.7, $p=0.00005$; 7.51 to 1.73, $p < 0.0001$; 7.82 to 2.82, $p < 0.001$) and this pattern was maintained at 1 month post-RFA compared to baseline (7.51 to 2.25, $p < 0.0001$; 7.82 to 3.3; $p < 0.001$). A significant pain relief was achieved regardless of whether patients had cement augmentation in two studies assessing the impact of RFA with or without cement augmentation on VAS pain scores. In these two studies, a significant decrease in pain scores was reported for patients receiving RFA alone and RFA+cement at 1 week (4.3 to 1.7. $p=0.0004$ and 6.6 to 1.7, $p=0.003$ respectively) and 15-36 months (7.9 to 4, $p=0.008$ and 7.6 to 3.5, $p=0.005$ respectively) after therapy. Few minor complications were reported and these included neural damage, radicular pain, vertebroplasty leakage and lower limb pain/numbness. In conclusion, the efficacy and safety of RFA were consistently positive between prospective and retrospective studies with reductions in pain and few procedural complications. However, the lack of control groups in the identified studies indicates the possibility of selection bias inherent in single arm studies. Controlled trials exploring efficacy and safety of RFA in patients with spinal metastases are warranted to provide robust evidence. The identified studies provide an initial foundation for such future trials.

Keywords : pain relief, radiofrequency ablation, spinal metastases, systematic review
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