Extracorporeal Shockwave Therapy Improves Functional Outcomes of Adhesive Capsulitis of the Shoulder in Patients With Diabetes

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Adhesive capsulitis of the shoulder (ACS) is the most prevalent musculoskeletal disorder of the upper extremity (1,2) among people with diabetes. ACS is characterized by intense shoulder pain with progressive limitation of joint mobility and functional disability, negative impact on the quality of life, and increased health care costs (3). In the population without diabetes, treatment options include supervised physical therapy, oral or intra-articular steroid injections, extracorporeal shockwave therapy (ESWT), and arthroscopic capsular release (4). Oral or intra-articular steroids lead to rapid pain relief and improved range of motion (ROM), although benefits from steroids may not be maintained beyond 6 weeks in patients with diabetes (5). In addition, steroids can significantly increase glucose levels, thus affecting glycemic control in patients with diabetes. Therefore , it would be preferable to avoid steroids and opt for alternative therapies in these individuals. In view of the efficacy of ESWT for ACS in individuals without diabetes (4), we evaluated the effect of ESWT on functional outcomes in patients with diabetes with ACS.

Fifty consecutive patients with diabetes (7 with type 1 and 43 with type 2 diabetes, men:women ratio 70:30, mean ± SD age 57.9 ± 13.0 years, disease duration 10.9 ± 7.9 years, HbA_{1c} 7.32 ± 1.40% [56.5 ± 15.3 mmol/mol], BMI 28.0 ± 5.3 kg/m^2, waist circumference 100.5 ± 13.2 cm) with ACS (pain duration 15.7 ± 13.2 months, in 70% of cases on side of the dominant hand) attending the Diabetes Unit of Sant'Andrea Hospital, Rome, Italy, were enrolled in this observational intervention trial. Inclusion criteria were known diabetes, shoulder pain, and ROM restriction (>75% ROM loss in ≥2 directions including abduction, flexion, external rotation, and internal rotation) for at least 3 months and no treatment other than analgesics within the past 3 months. In all patients, shoulder radiographs, soft-tissue sonography, and/or MRI studies were obtained at least 2 weeks before enrollment in the study. All patients received ESWT once a week for 3 weeks, 2,400 shots in an anterior-to-posterior direction on the anterior shoulder joint using a low/moderate energy flux density (0.06–0.14 mJ/mm^2, depending on individual pain tolerance). Functional outcome evaluations were performed using the Visual Analog Scale (VAS), the Constant Shoulder Score (CSS), and the Disabilities of the Arm, Shoulder and Hand Score questionnaire (QuickDASH) at baseline (T_0) and after 2 (T_1), 4 (T_2), and 6 (T_3) months.

Over the study period, all functional outcomes improved markedly, with a 3.14-fold and 2.97-fold decrease of VAS and QuickDASH, respectively, and a 39.7% increase of CSS. Pairwise comparisons showed significant improvements even at T_1, with further amelioration of functional outcomes at T_2 and T_3, indicating that ESWT was beneficial both acutely and chronically (Table 1). No relevant side effects were reported throughout the study.

Though observational and uncontrolled, this pilot trial is, to the best of our knowledge, the first study assessing the effect of ESWT on functional outcomes in patients with diabetes with ACS. Results indicate that ESWT may be effective, feasible, and well tolerated and can therefore represent a valid alternative to steroids for ACS treatment in patients with diabetes. However, these findings need to be confirmed by a randomized controlled trial.

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Table 1—Functional evaluations at T_0, T_1, T_2, and T_3 and pairwise comparisons between time points

Functional outcomes	Assessment times*				Comparisons†					
	T_0	T_1	T_2	T_3	T_0 vs. T_1	T_0 vs. T_2	T_0 vs. T_3	T_1 vs. T_2	T_1 vs. T_3	T_2 vs. T_3
VAS	6.9 ± 1.6 (4–10)	5.2 ± 2.3 (1–9)	3.6 ± 2.3 (0–8)	2.2 ± 2.7 (0–8)	−1.74 (−1.15, −2.33), <0.001	−3.4 (−2.8, −3.99), <0.001	−4.78 (−4.04, −5.52), <0.001	−1.66 (−1.13, −2.19), <0.001	−3.04 (−2.24, −3.84), <0.001	−1.38 (−0.83, 1.93), <0.001
CSS	60.5 ± 13.9 (28–81)	68.7 ± 14.4 (38–91)	77.0 ± 13.8 (48–96)	84.5 ± 15.0 (28–98)	8.2 (5.2, 11.2), <0.001	16.5 (12.9, 20.2), <0.001	23.9 (19.0, 28.9), <0.001	8.3 (5.2, 11.5), <0.001	15.8 (10.6, 21.0), <0.001	7.5 (4.0, 10.9), <0.001
QuickDASH	48.7 ± 14.3 (25–77)	36.2 ± 7.6 (9–71)	24.8 ± 15.8 (5–64)	16.4 ± 19.4 (2–64)	−12.5 (−8.7, −16.4), <0.001	−23.9 (−19.4, −28.5), <0.001	−32.3 (−26.6, −37.9), <0.001	−11.4 (−7.6, −15.2), <0.001	−19.7 (−14.4, −25.0), <0.001	−8.3 (−5.1, −11.6), <0.001

*Mean ± SD (range). †Within-group difference (95% CI), *P* value.

Duality of Interest. No potential conflicts of interest relevant to this article were reported.

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