HbA_{1c} Values Determine the Outcome of Intrasheath Injection of Triamcinolone for Diabetic Flexor Tenosynovitis

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Stenosing flexor tenosynovitis (FTS), commonly known as "trigger finger," is caused by a disproportion between the flexor tendon and its surrounding tendon sheath, in which smooth gliding of the flexor tendon within its sheath is restricted. First annular pulley is the most affected lesion. Intrasheath injection of triamcinolone is commonly used as an initial treatment. FTS has a reported incidence ranging from 1.7 to 2.6% in the general population (1–4). However, the incidence of FTS in diabetes is reported to be between 10 and 20% (1–3,5,6).

Diabetic FTS is not an established clinical entity. FTS with diabetes, however, is related to diabetic retinopathy (3,7,8). If FTS is regarded as a diabetes-induced complication, its clinical appearance should be related to the degree of glycemic control, the duration of diabetes, or the severity of associated diabetes complications.

Since a number of other metabolic and anatomic disorders are associated with diabetes, we considered some of these in our assessment of FTS and its response to intrasheath injection of triamcinolone.

RESEARCH DESIGN AND METHODS

— The study comprised 179 patients with FTS (287 fingers) in diabetic conditions. Excluded patients were those with rheumatoid arthritis, gout, renal failure, and pyogenic tenosynovitis and those with a history of FTS for >1 year before steroid injections.

The diagnosis of FTS was made by M.K. Severity of FTS is listed in Table 1. Treatment consisted of an injection of 10 mg triamcinolone acetonide mixed with 0.5 ml lidocaine (1%). The solution was injected into the synovial tendon sheath just proximal to the first annular pulley. If the symptom improved unsatisfactorily, the injection was repeated up to a maximum of three times at an interval of 2 weeks. The patients were requested to continue another 1 year of sequential follow-up (2 weeks, 3 months, 6 months, and 1 year after final injection). A recurrence was defined as the return of any symptoms of FTS. Diabetes-related variables during the fasting state regarding HbA_{1c} (A1C), triglyceride, total cholesterol, LDL cholesterol, and HDL cholesterol in each affected finger were investigated. Each variable was defined as an average between values of nearest date before the first injection and values of the immediate date after last injection. History of statin administration was also investigated. Clinical results in each finger were assessed by the duration between final injection and the onset of recurrence. Complete relief of symptoms with no episode of recurrence at each follow-up period was defined as success. Logistic regression analysis was performed to examine the contribution of independent variables on clinical results in each finger. Independent variables were defined as a total of 15 factors, which are listed in Table 1. Dependent variables were defined as clinical results at the 1-year follow-up period, which was divided into two indexes (0 and 1). Success at the 1-year follow-up period corresponded to 0. Persistence or recurrence of FTS within a 1-year follow-up period corresponded to 1. Independent variables showing significance were analyzed as to the rate of success at each follow-up period by χ^2 test or Fisher's exact test. A P value <0.05 was accepted as statistically significant.

RESULTS

— Overall, success at the 1-year follow-up was obtained in 27 fingers (9%). When A1C values were divided into two indexes (0: A1C <8.0%; 1: A1C ≥8.0%) and included as an independent variable, A1C values were positively significant (adjusted odds ratio [OR] 17.16, $P = 0.009$), as shown in Table 1. The difference of success rates between two groups was not significant at 2 weeks, 3 months, and 6 months. At 1 year, the success rate was 1.3% (1 of 77 fingers) in groups with A1C ≥8.0% and 12.4% (26 of 210 fingers) in groups with A1C <8.0%. The difference of success rates between both groups was statistically significant ($P = 0.004$). When A1C values were divided into three indexes (0: A1C <6.5%; 1: 6.5% ≤ A1C < 8.0%; 2: A1C ≥8.0%) and included as an independent variable, A1C values were still positively significant (adjusted OR 2.73, $P = 0.004$; data not shown).

CONCLUSIONS

— Steroid injections for FTS were reported to be effective with variable success rates ranging from 38 to 92% in the general population (9–14). Among several steroids, triamcinolone is widely used (9–11). However, there are only a few organized reports dealing with the results of intrasheath injection of steroids for FTS in diabetes (15,16). Each report shows lower success rates in diabetic patients when compared with those in nondiabetic patients. The reason for unsatisfactory results in diabetic patients is assumed to be associated with disturbances of collagen metabolism in flexor tendon sheaths, which may be

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Abbreviations: FTS, flexor tenosynovitis.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

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Table 1—*Associations between various independent variables and clinical results using logistic regression analysis*

		Nonadjusted		Adjusted	
	n	OR (95% CI)	*P* value	OR (95% CI)	*P* value
Age at diagnosis of FTS (years)		0.72 (0.39–1.31)	0.28	1.1 (0.54–2.24)	0.79
0: <55	54				
1: 55–70	154				
2: ≥70	79				
Sex		1.55 (0.69–3.46)	0.29	1.13 (0.44–2.92)	0.8
0: male	142				
1: female	145				
Type of diabetes		0.57 (0.13–2.52)	0.46	0.53 (0.08–3.74)	0.52
0: type 1	34				
1: type 2	253				
Estimated duration of diabetes (years)		0.6 (0.33–1.08)	0.09	0.44 (0.22–0.89)	0.02
0: <10	55				
1: 10–20	117				
2: ≥20	115				
Severity of FTS*		0.66 (0.39–1.12)	0.12	0.54 (0.29–1.001)	0.0503
0: grade 1	97				
1: grade 2	123				
2: grade 3	67				
Duration of FTS before treatment (months)		1.001 (0.56–1.79)	0.998	1.13 (0.57–2.24)	0.73
0: <3	202				
1: 3–6	53				
2: 6–12	32				
Number of injections		0.67 (0.39–1.15)	0.14	0.74 (0.39–1.4)	0.36
0: one	195				
1: two	65				
2: three	27				
Diabetic retinopathy†		1.02 (0.45–2.28)	0.97	0.71 (0.26–1.95)	0.51
0: no	169				
1: yes	118				
Diabetic nephropathy‡		1.45 (0.33–6.46)	0.63	2.4 (0.44–13.19)	0.31
0: no	258				
1: yes	29				
A1C (%)		10.74 (1.43–80.58)	0.02	17.16 (2.05–143.27)	0.009
0: <8	210				
1: ≥8	77				
Triglycerides (mg/dl)		1.05 (0.34–3.19)	0.94	0.82 (0.16–4.27)	0.81
0: <150	243				
1: ≥150	44				
Total cholesterol (mg/dl)		0.73 (0.28–1.92)	0.52	0.55 (0.08–3.93)	0.55
0: <220	236				
1: ≥220	51				
LDL cholesterol (mg/dl)		0.64 (0.23–1.81)	0.4	0.62 (0.09–4.23)	0.62
0: <140	249				
1: ≥140	38				
HDL cholesterol (mg/dl)		0.68 (0.09–5.35)	0.71	0.32 (0.03–3.37)	0.33
0: ≤40	15				
1: >40	272				
Statin medication		2.1 (0.61–7.23)	0.24	3.18 (0.82–12.37)	0.1
0: no	230				
1: yes	57				

*Grade 1, pain or uneven movement without snapping or locking (gradually or occasionally); grade 2, snapping on motion without locking (gradually or occasionally); grade 3, locking in extended or flexed position (gradually or occasionally). †Assessment using fundscopy after dilation of the pupils with a mydriatic agent. ‡Assessment by the presence of microalbuminuria (albumin excretion rate ≥20 μg/min) or clinical proteinuria.

due to the accumulation of advanced glycation end products, increased cross-linking of collagen and resistance to collagenase, increased oxidative stress, or increased hydration of collagen mediated by the polyol pathway (6,8,15,16).

This study documented for the first time the factors affecting the outcome of steroid injections for FTS in diabetic conditions. The success rate at the 1-year follow-up period appears to be much lower when compared with other reports. This may be because we considered any sign of recurrence within 1 year as treatment failure. According to logistic regression analysis with 15 independent variables, only A1C values were positively correlated with poor clinical results. High values of A1C represent poor glycemic conditions for the previous 1–2 months, and more abnormal glucose metabolism, including enhanced formation of advanced glycation end products, oxidative stress, or activation of the polyol pathway, is expected to occur. A surprising finding was that the estimated duration of diabetes was inversely correlated with the clinical results, though the nonadjusted OR was not statistically significant. We cannot draw conclusions from this subject.

We demonstrated that A1C values determine the outcome of intrasheath injection of triamcinolone for FTS in diabetic conditions. Diabetic patients with poor glycemic control, especially groups with A1C ≥8.0%, should be informed that the outcome of triamcinolone injections is not guaranteed.

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