Assessment of tennis elbow using the Marcy Wedge-Pro

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The Marcy Wedge-Pro (MWP), a device used in training by tennis players, was employed in the assessment of tennis elbow. The MWP was used to measure the ability of patients to perform wrist extension exercises, since pain resulting from this specific activity is a prominent symptom of the condition. The MWP results were compared with clinical measures and found to identify accurately patients who responded to treatment ($P < 0.05$). This study illustrates the potential of the MWP to assess tennis elbow quantitatively.

Keywords: Tennis elbow, pain, visual analogue scale (VAS), Marcy Wedge-Pro (MWP)

Tennis elbow is a common, often chronic condition with a prevalence of 1–3% in the general population[1,2]. Tennis players are especially prone to this disorder with a cumulative incidence of up to 40%[3]. Tennis elbow is considered to be a strain injury of the enthesis due to repetitive mechanical stresses acting at the origin of the common forearm extensor muscle group, specifically extensor carpi radialis brevis[4]. Diagnostic features of tennis elbow include a history of localized lateral humeral epicondylar pain and tenderness, with exacerbation of pain on contraction or passive stretching of the extensor muscle group[5].

Despite the different treatments available for tennis elbow, there is no consensus on optimal management[6,7]. One reason for this may be that there is no specific, objective method of assessment[7]. Thus, there is a need for accurate and quantitative measures which are relevant to the main symptom, which is epicondylar pain on muscle activity.

Pain scoring systems including visual analogue scales (VAS) have been used, but these depend on patient perception[8,9]. Grip strength using a sphygmomanometer cuff is an objective measure which has been used widely[10–14]. However this exercise lacks specificity, since the forearm extensors act as muscles of synergy at the wrist, and grip strength is derived from finger flexion.

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0306-3674/93/040233-04

Following on from previous work in painful frozen shoulder in which local autonomic dysfunction was identified, the aim of this study was to examine for similar changes in other forms of soft tissue rheumatism[15,16]. Our intention was to investigate the effects of clinical improvement in tennis elbow, and not to compare the efficacy of different treatments. The work presented here concerns the methods used to monitor clinical response. For this purpose we evaluated a device used in training by tennis players, called the Marcy Wedge-Pro (MWP; Escalade International, Swansea, UK) shown in *Figure 1*. The MWP provided objective and quantitative measures of the ability to exercise the forearm extensor muscle group.

Patients and methods

Ten consecutive patients referred with unilateral tennis elbow were studied. The inclusion criteria were: a typical history of local pain and epicondylar tenderness; an increase in pain on resisted wrist extension; and the absence of other elbow disease. Local Ethical Committee approval was obtained and all patients gave prior informed written consent. There were wide variations in severity and duration of symptoms, precipitating factors, and prior treatments as shown in *Table 1*.

Patients were assessed on four occasions, twice for baseline measures, and following treatment, 1 and 4 weeks later. Therapy was given as deemed appropriate (by the author RWS) (*Table 1*), together with advice to rest for 1 week. Clinical measures were VAS to assess pain on digital enthesis pressure and exercise, and a self-reported questionnaire for forearm disability in the previous week.

Figure 1. The Marcy Wedge-Pro (MWP)

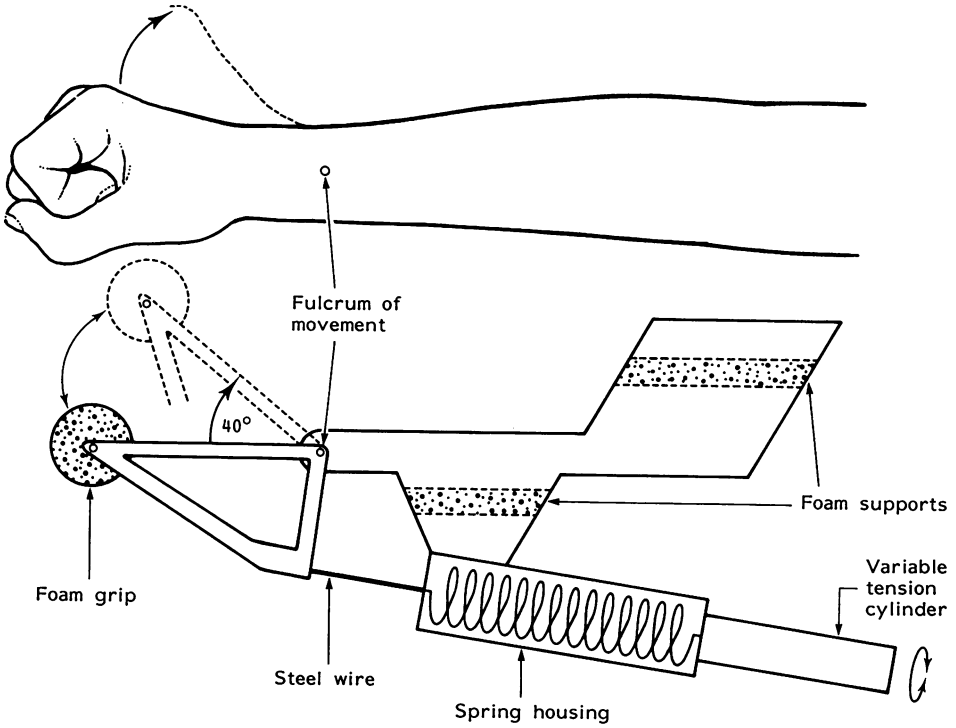

Figure 2. The MWP was used to test repetitive wrist extension exercises using a protocol which required 40° of extension

The MWP was used to measure the ability to perform wrist extension exercises using both unaffected and affected arms in this order at each visit. Patients were seated, elbows flexed to 90° resting on a couch with forearms in the mid-supine/prone position and placed in the MWP as illustrated in *Figure 1*. The spring of the MWP was adjusted to a pre-set tension throughout the study. With the wrist in the anatomical position (0°) tension was 1.950 kg (*Figure 2*). Patients were required to extend the wrist by an angle of 40° and return to the anatomical position to complete each exercise cycle. This was measured on a scale on the MWP. A target of 50 cycles was set and patients were requested to perform this exercise repeatedly, but to stop in the event of pain. The MWP performances in individual patients following treatment were compared with baseline data.

Student's *t* test was used to compare paired parametric data and McNemar's test for non-parametric disability ratings. Finally, patients were classified by their clinical response. Responders were defined by the absence of disability and an improvement in both VAS scores. A two-tailed Fisher's test of exact probability was used to compare this classification with the outcomes as expressed by MWP data.

Results

Table 1 includes details of outcome in individual patients following therapy. *Table 2* summarizes

Table 1. Details of tennis elbow patients, therapy and outcome

Sex	*Age (years)**	*Activity (visit 1)*	*Duration (months)†*	*Precipitating events*	*Therapy given‡*	*% Change MWP score*	*Clinical improvement*
M	42	Nil	20	DIY	HA inj	+163	Yes
M	38	Full	1	Squash	NSAID	+13	Yes
M	56	Limited	60	Unknown	T inj	+74	Yes
F	49	Limited	24	Shopping	T inj	−11	No
M	45	Limited	5	DIY	T inj	+316	Yes
M	46	Full	24	DIY	HA inj	+40	Yes
F	36	Limited	36	Housework	T inj	−8	No
M	31	Limited	17	Lifting	T inj	+400	Yes
M	46	Full	24	DIY	NSAID	−20	No
M	63	Full	4	Gardening	HA inj	+47	Yes

*Mean age 45 years; †mean duration 21 months; ‡Therapy: T inj, local injection 10–20 mg triamcinolone hexacetonide + 1 ml lignocaine 1%; HA inj, local injection 25 mg hydrocortisone acetate + 1 ml lignocaine 1%; NSAID, non-steroidal anti-inflammatory drug, Topical Felbinac Gel 3%, four times daily for 1 week

Table 2. Reported forearm activity in previous week*

	Visit 1	*Visit 2*	*Visit 3*	*Visit 4*
Nil	1	1	5	0
Limited	5	7	4	2
Full	4	2	1	8

*Values are patient numbers; $P < 0.05$

changes in disability and shows that eight patients reported full activity at the final visit ($P < 0.05$). Mean parametric measures improved, shown graphically in *Figure 3* with levels of significance indicated. The MWP exercise performances increased for the affected arms, while pain on both VAS reduced. Seven patients improved clinically. There was no significant change in MWP data from the unaffected arms ($P > 0.05$).

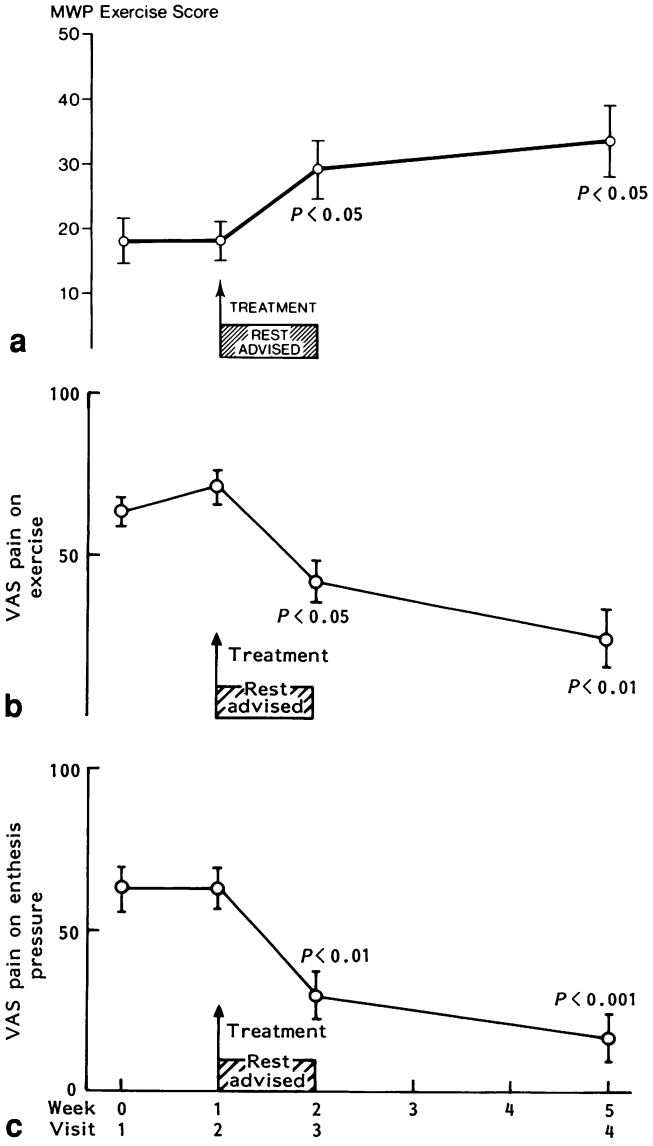

Figure 3. **a** MWP and **b,c** VAS data (mean ± 1 s.e.) of affected arm

The MWP performances of the affected arms showed seven patients with improved performance (mean increase = +150%) and three in whom there was no change or a deterioration (mean = −13%). These results identified the same seven responders as the clinical classification ($P < 0.05$) (*Table 1*).

Discussion

In this study the MWP was used to quantify and monitor disability in tennis elbow. The MWP results were in agreement with other clinical measures of response. It provided objective and quantitative measures, which were sensitive and most importantly, relevant to the biomechanics of the condition. The exercise protocol used was reproducible and has the potential for modification. The MWP workload may be altered by adjusting the spring tension or angle of movement.

The diagnosis of tennis elbow is based on characteristic clinical features but there is a need for accurate measures of response to treatment, since therapy remains largely empirical. The ideal measure must take into account the dominant symptom, which is enthesis pain on exercise and in this regard the MWP is specific. These preliminary results suggest that the MWP is useful in the assessment of tennis elbow and we would recommend its use to others working in this field.

Acknowledgements

We would like to acknowledge the statistical advice of Dr M. J. Campbell of the University of Southampton Medical School.

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