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Treatment of Sports Injuries with Traumeel® Ointment: A Controlled Double-Blind Study with Traumeel® Ointment for Treatment of Sports Injuries

From the Institute of Sports Medicine at Johann Wolfgang Goethe University, Frankfurt/Main, Germany

Professor D. Böhmer, M.D., and P. Ambrus, M.D.

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Key words: Traumeel, double-blind study, sports injuries

Abstract

A controlled double-blind study was conducted on outpatients with sports injuries, to compare with a placebo the effectiveness of Traumeel ointment in its normal commercially available form (Traumeel S), and in a form of this preparation containing only six constituents (Traumeel Sine). The primary criteria employed to assess medication effectiveness were regression of swelling and reduction in skin temperature. Secondary criteria for effectiveness were the following: increase in maximum muscle force, reduction of pain intensity (pain index), time until resumption of training, and overall evaluation of effectiveness by patient and physician.

A total of 102 patients was included in this study, with breakdown into groups of 34 patients each. It was possible to evaluate data for all patients except one (who was disqualified for not satisfying criteria for acceptance into the study). All other patients completed the study in compliance with the criteria for conduct of the study.

With respect to the main criteria of skin temperature, no differences became apparent among the three treatment groups; variance was determined, however, for swelling. Convincing evidence has been obtained that there is no difference between the effectiveness of Traumeel S and Traumeel Sine, but that the effectiveness of both differs from that of the placebo. Purely formally, however, in the sense of control of multiple-level alpha, only the difference between Traumeel Sine and the placebo was able to be verified.

All secondary criteria - such as maximum muscle force, pain index, resumption of training, and overall evaluation - confirm without exception, and with low P values, that there is no difference in effectiveness between the two Traumeel preparations, but that a great difference does exist between these preparations and the placebo. The values of P on the 15th day were smaller than 0.001 for the pain index and the overall evaluation. In addition, the Mann-Whitney characteristic P(X<Y) reveals that these differences are of considerable clinical significance. At the end of the study, the patients and the physician evaluated the tolerance of the tested substances as good to very good. No undesired side effects were observed in any of the three treatment groups.

Introduction

In amateur and professional areas of athletics in Germany, the number of sports injuries has shown progressive increase over the recent past: the level is now at approximately 1.6 million sports injuries per year in Germany. These injuries primarily involve injuries by blunt force in the form of contusions and sprains, accompanied by subcutaneous rupture of tissue in the afflicted area. Edemas (permeability alteration) and vascular injuries (hemorrhages) are the consequence. The majority of these injuries are minor in nature and will as a rule heal within two to six weeks. Such injuries, however, do have the initial effect of terminating athletic activity, and they do in certain cases attain considerable significance as illness in their own right. An essential therapeutic objective is therefore the elimination of primary symptoms such as swelling, inflammation, and pain - as well as the ability to completely resume sports activities as soon as possible. This objective is possible through interruption of the mutual dependence of inflammatory and traumatic disorders: i.e., pain, muscle stiffness, and restriction of mobility.

A series of studies conducted over the past years has investigated the effectiveness of Traumeel ointment for the therapy of such sports injuries. Post-marketing drug surveillance conducted with 3,422 patients using Traumeel S revealed good to very good therapeutic results with respect to treatment of first- and second-degree sprains and contusions, and to reduction of the term of therapy [St. Zenner and H. Metelmann, 1991]. In their 1988 clinical tests conducted to compare the effectiveness of Traumeel ointment with that of a placebo in the therapy of ankle sprains, J. Zell, W.D. Connert, J. Mau, and G. Feuerstake verified that Traumeel ointment was superior to the placebo with respect to the primary objective criterion of "restoration of complete ankle mobility," and for the secondary comparison criterion "pain upon movement and inversion." Planning is for the results of this study to be validated in a further investigation.

Methodology of testing

Purpose of the study and testing criteria

The objective of this controlled double-blind study was evaluation of the effectiveness of Traumeel ointment in conjunction with regression of the main consequences of sports injuries: first- and second-degree sprains and contusions. The parameters of testing were:

- Swelling;
- skin temperature;
- maximum muscle force;
- pain intensity;
- time elapsed until resumption of training without complaints.

The specific purpose of the study was verification of the superior effectiveness of Traumeel over the placebo. In addition to the well-known preparation Traumeel ointment, the study also included verification of the effectiveness of a new preparation containing only six of the constituents of Traumeel ointment.

patient for whom double data were submitted (for thigh and calf). Continuously conducted quality control enabled complete acquisition of all findings data.

Patient characteristics

Of the 102 patients originally available for the study, it was possible to analyze the findings from 101 (as stated, one patient did not satisfy the selection criteria). Of these 101 patients, 34 received Traumeel S, 33 obtained Traumeel Sine, and 34 were treated with the placebo. Table 1 shows a compilation of the collected data.

The data above in Table 1 reveal that the three therapy groups are eminently comparable with respect to age, sex, height, and weight. Even with the Lorenz Index - which was calculated in order to compensate for any potential influencing factors such as body weight - only slight differences were apparent. The three therapy groups were furthermore comparable to a great degree with regard to diagnosis, intensity of the injury, case history, and localization.

Primary criteria for effectiveness

For the two primary criteria for effectiveness - i.e., abatement of swelling and normalization of skin temperature - confirmatory analysis of the two points in time of patient examination was conducted in the sense of verification of effectiveness. As stipulated by the provisions set forth with the statistical methods, the four values of P were required to be smaller than 0.012, 0.017, 0.025, and 0.05. As Table 2 shows, this provision was satisfied only for the percent of abatement of swelling on the 15th day (P = 0.0067). In the individual comparisons of the three therapy groups, application of the Shaffer Method revealed superiority of Traumeel Sine over the placebo (P = 0.0028). In the strict sense of confirmatory testing, these data therefore verify superiority of Traumeel Sine over the placebo only for the measurement of circumference on the fifteenth day of therapy. Differences in the primary criteria are indeed apparent on the fifth day of therapy - although they do not achieve the level of significance stipulated for this study. There is practically no difference between the two Traumeel formulations. With respect to skin temperature, no differences became apparent among the three therapy groups. On the fifth day, however, the Mann-Whitney characteristic P(X<Y) reveals slight differences in favor of the two Traumeel groups, over the placebo.

Therapy Group	1st day	2nd ... 15th day
Traumeel S (Traumeel Ointment 1)	1 x 10 g	2 x 10 g / day
Traumeel Sine (Traumeel Ointment 2)	1 x 10 g	2 x 10 g / day
Placebo (Traumeel ointment base)	1 x 10 g	2 x 10 g / day

Criteria	Traumeel S N	(in %)	Traumeel Sine N	(in %)	Placebo N	(in %)
Number of patients (N)	34		33		34	
Age (in years):						
Mean (S.D.)	31.1	(9.83)	31.3	(9.88)	29.5	(11.17)
Min.-Max.	19.0 - 50.0		18.0 - 50.0		18.0 - 50.0	
Median	27.0		30.0		24.5	
Sex:						
Male	21	(61.8)	22	(66.7)	23	(67.6)
Female	13	(38.2)	11	(33.3)	11	(32.4)
Height (in cm):						
Mean (S.D.)	177.4	(10.24)	175.7	(10.05)	177.8	(8.71)
Min.-Max.	163.0 - 208.0		152.0 - 194.0		160.0 - 193.0	
Median	175.0		175.0		178.0	
Weight (in kg):						
Mean (S.D.)	75.7	(13.75)	71.9	(11.19)	72.7	(11.03)
Min.-Max.	55.0 - 110.0		50.0 - 92.0		48.0 - 96.0	
Median	72.5		73.0		73.0	
Lorenz Index (in %):						
Mean (S.D.)	8.04	(13.38)	4.22	(8.89)	3.24	(9.94)
Min.-Max.	-13.00 - 60.80		-13.80 - 24.30		-17.20 - 22.30	
Median	6.95		3.60		2.10	
Diagnosis:						
Contusions	20	(58.8)	16	(48.5)	11	(32.4)
Sprains	14	(41.2)	17	(51.5)	23	(67.6)
Pain intensity:						
Slight	1	(2.9)	0	(0.0)	1	(2.9)
Moderate	33	(97.1)	33	(100.0)	33	(97.1)
Case history:						
Sports injury	31	(91.2)	32	(97.0)	34	(100.0)
Other cause	3	(8.8)	1	(3.0)	0	(0.0)
Prior treatment:						
Medicamentous	0	(0.0)	0	(0.0)	0	(0.0)
Phys. therapy	7	(20.6)	6	(18.8)	8	(23.5)

Table 1: Compilation of demographic and case-study data.

Criterion	Test	Data from examination on the 5th day		Data from examination on the 15th day	
		P	P (X < Y)	P	P (X < Y)
Abatement of swelling (in cm of circum-ference)	Overall	0.0252		0.0067	
	Traumeel S vs. Traumeel Sine	0.3929	0.56	0.4147	0.56
	Traumeel S vs. placebo	0.0440	0.36	0.0214	0.34
	Traumeel Sine vs. placebo	0.0129	0.32	0.0028	0.29
Skin temp. in °C	Overall	0.4301		0.8453	
	Traumeel S vs. Traumeel Sine	0.5539	0.54	0.7477	0.48
	Traumeel S vs. placebo	0.3548	0.43	0.5586	0.46
	Traumeel Sine vs. placebo	0.2480	0.41	0.8369	0.48

Table 2: Compilation of test statistics for the two primary criteria used to evaluate effectiveness (percent change with respect to baseline data).

Therapy		Baseline	3rd ... 5th day	13th ... 15th day
Traumeel S	N	34	34	34
	Mean (StD)	34.12 (7.339)	-1.94 (1.242)	-4.38 (1.810)
Traumeel Sine	N	33	33	33
	Mean (StD)	33.22 (7.697)	-2.16 (1.483)	-4.68 (1.776)
Placebo	N	34	34	34
	Mean (StD)	32.50 (7.220)	-1.44 (1.136)	-3.46 (1.540)

Table 3: Abatement in swelling - reduction in circumference (in cm), with percent change with respect to baseline.

Therapy		Baseline	3rd ... 5th day	13th ... 15th day
Traumeel S	N	34	34	33
	Mean (StD)	1.21 (0.403)	0.75 (0.331)	0.25 (0.235)
Traumeel Sine	N	33	33	33
	Mean (StD)	1.24 (0.419)	0.87 (0.468)	0.40 (0.482)
Placebo	N	34	33	33
	Mean (StD)	1.27 (0.410)	1.12 (1.250)	0.75 (1.035)

Table 4: Difference in skin temperature (in °C) between injured and contralateral uninjured side.

Measurement of the effectiveness criteria took place on the injured as well as on the uninjured contralateral extremity.

The primary criteria for effectiveness were the following:

- Abatement of swelling (i.e., of the measured circumference).
- Normalization of skin temperature.

Circumference of the injured extremity (in cm):

The circumference of the injured extremity was measured by means of a flexible tape measure before treatment on the first day, as well as on the fifth and fifteenth days. Measurement took place on all days at the same, initially marked point. On the contralateral, uninjured side, comparative measurements took place during each of the examinations.

Measurement of the skin temperature (in °C):

The skin temperature was measured with a proximity thermometer: a radiation thermometer of type KT+41, made by the company Heimann GmbH of Wiesbaden, Germany. At the first measurement, the point of greatest pressure sensitivity was taken as registration point and was marked for the following examinations. Skin-temperature measurements were performed according to the identical procedure on the contralateral, uninjured side.

Secondary criteria for therapeutic effectiveness:

- Maximum muscle force, measured in kg by a dynamometer-type device.
- Abatement of the pain intensity, expressed as a pain index - a cumulative index value composed of summed values for pain experienced at rest, in motion, and under pressure (each valued on a scale of 0 to 2: 0 = no pain; 1 = slight pain; 2 = severe pain).
- Time elapsed until resumption of sports activities without complaints.
- Number of therapy interruptions.
- Evaluation of the effectiveness of treatment by the patients and the physician at the end of therapy (on a valuation scale from 1 to 4, with 1 = very good results; 2 = good; 3 = moderate; 4 = poor).

Maximum muscle force as well as pain experienced at rest, in motion, and under pressure were measured or evaluated and recorded before the beginning of therapy, and upon each of the following examinations, on the fifth and fifteenth days.

Testing procedure

The testing procedure was a randomized parallel group test carried out under double-blind conditions. The entire patient population was broken down into the following three therapy groups:

- One group treated with Traumeel S;
- one group treated with Traumeel Sine;
- one group treated with a placebo (Traumeel ointment base).

Thirty patients were initially selected for each group, which ensured a sufficient number of independent observations for evaluation of distribution models. In order to compensate for interruptions in therapy or possible nonuniformities in the treatment groups, four additional patients were accepted into each group - i.e., a total of 34 was selected for each therapy group. The number of cases was not determined in accordance with specific calculations, since information on the primary criteria was not yet available at the time involved.

Randomizing took place according to the principle of randompermutated blocks, with each block consisting of six patients each. We employed the PC program RANCODE developed by the company IDV (located in Gauting, near Munich) for this work.

The study was conducted under strict double-blind conditions. The three ointments applied could not be distinguished by outward observation. They were identified by consecutive numbers.

Biometric evaluation procedures

In the plan of testing, the objectives of the study were primarily formulated in an exploratory sense. Swelling and skin temperature were, however, defined as primary test criteria. After completion of the study - but before examination of data collected - definition took place as follows, in the sense of confirmatory analysis: for both primary criteria, data recorded at the two points of time (examinations) were subjected to confirmatory evaluation in the sense of effectiveness verification. Multiple-level alpha was required to be maintained at 0.05 by employment of Bonferroni-Holm adjustment methods; i.e., the four ordered values of P were required to be smaller than 0.012, 0.017, 0.025, and 0.05. For these four situations, multigroup tests were carried out. Individual comparisons of the three treatment groups were able to be conducted in accordance with the Shaffer method, in conjunction with significant global testing, and with the Bonferroni-Holm adjusted alpha valid there [3]. Initially, therefore, all nonadjusted values of P are cited, and are then interpreted with the respective adjustment. All other analyses were conducted on an exploratory basis, in which cases values of P have been cited. These values, however, should not be understood in the sense of significance.

For the primary criteria of swelling and skin temperature, the percentage reduction from the baseline value was determined for purposes of adjustment of the initial situation, and in order to compensate for any variance in initial situations which may have arisen.

In analysis with the secondary criterion of maximum muscle force (in kg), the difference between the injured and the contralateral side was calculated.

Kruskal-Wallis analysis was carried out for all global tests. Individual comparisons for the three treatment groups took place with the aid of the Wilcoxon-Mann-Whitney-U Test. Logrank-Test was applied for analysis of data on the time required until resumption of training (performed on the Testimate program developed by the company IDV, located in Gauting, near Munich).

The values of P are suitable only to a limited degree for verification of the relevance of therapeutic effects, or of variables indicating these effects. As a result, we applied the Mann-Whitney characteristic P(X<Y), which is effectively suitable in such cases as a measure of relevance. This characteristic indicates the probability that a randomly selected patient from group X will demonstrate better therapeutic effects than a randomly selected patient from group Y. The fol-

lowing applies for analytic procedures here:

P(X<Y) = 0.50 equality
P(X<Y) = 0.56 or 0.44 small variance
P(X<Y) = 0.64 or 0.36 moderately great variance
P(X<Y) = 0.71 or 0.29 great variance.

Patient population for this study

As indicated in the testing records, we included patients of both sexes in our study, with ages ranging from 18 to 50. We provided all therapy strictly on an outpatient basis. We instructed the patients to refrain from sports activities during the entire period of therapy. We further instructed them to apply an occlusive-type dressing to the injured point for half an hour, twice a day, and to rest the injured extremity during these half-hour periods. This dressing consisted of a lightly perforated, aluminum-coated textile bandage. The patient was allowed to wash and bathe as usual.

For this study we accepted only patients who had been injured immediately prior to initial therapy and who had not previously received any medication which would have a bearing on the results of therapy.

The accepted patients were also required to satisfy the following selection criteria:

Criteria for selection:

- Age between 18 and 50;
- normal general condition of health;
- visible or palpable alteration in tissue, with injury as a consequence of a sprain or a contusion;
- requirement only for outpatient therapy;
- slight or moderate degree of injury severity.

Relevance of any of the following criteria resulted in elimination from the study:

Criteria for rejection:

- Simultaneous administration of antiphlogistics and/or analgesics;
- allergy as attested in the patient's case history;
- skin disorder in the vicinity of the injury;
- an injury older than four days;
- an injury previously treated with medication;
- more than one unilateral or bilateral injury;
- previous injuries to the same extremity within six months prior to inclusion in this study;
- open injuries with risk of infection;
- lack of current participation in training or sports.

Adjuvant therapy allowed during the study:

The following forms of adjuvant therapy were allowed:

- Cold compresses during the first half hour of action of the occlusive dressing.
- Paracetamol as analgesic in case of severe pain.

Therapeutic procedure and content of medication used

Therapy applied:

The injured patients received their first medication no later than on the fourth day after the injury. Following initial treatment, the patients applied the medication twice daily themselves, until the fifteenth day. We instructed the patients to apply an amount of ointment which would sufficiently cover the area of the lesion, to apply an occlusive bandage over the ointment for half an hour, and to cover the dressing with a cold compress. The patient was additionally instructed to rest the injured extremity during this half-hour period.

As a rule, the patients used approx. 6 ... 10 g of ointment for each application. A string of ejected ointment 10 cm long corresponds to approx. 3 g. For a maximum of 30 application sessions, each patient would therefore require 30 x 10 = 300 g of ointment. We consequently dispensed to each patient three tubes of ointment, each containing 100 g of the tested preparation and the comparison preparation. The therapeutic procedure was identical for all three test groups.

Content of medication:

The following were contained in 100 g of the ointment with medicinally active agents:

Traumeel ointment 1 (Traumeel S):

Aconitum D1 0.05 g; Arnica D3 1.50 g; Belladonna D1 0.05 g; Bellis perennis Ø 0.10 g; Calendula Ø 0.45 g; Chamomilla Ø 0.15 g; Echinacea angustifolia Ø 0.15 g; Echinacea purpurea Ø 0.15 g; Hamamelis Ø 0.45 g; Hepar sulfuris D6 0.025 g; Hypericum D6 0.09 g; Mercurius solubilis Hahnemanni D6 0. 04 g; Millefolium Ø 0.09 g; Symphytum D4 0.10 g.

Traumeel ointment 2 (Traumeel Sine):

Arnica D3 1.50 g; Hamamelis Ø 0.45 g; Millefolium Ø 0.09 g; Mercurius solubilis Hahnemanni D6 0.04 g; Hypericum D6 0.09 g.

Note: Ø = mother tincture. D1 = the first decimal attenuation, etc.

Placebo:

The control group received 100 g of Traumeel ointment base, without the medicinally active agents.

Medication

All the patients in the three therapy groups observed the instructions as stipulated in the test protocol, until the study was completed. Therapy with the ointment dressing took place according to the following plan:

No patient received medicamentous therapy before or during the study. In a number of cases, the patients received adjuvant physical therapy before this study began: this therapy ended, at the latest, at the first day of the study.

Conduct of the study

This study was conducted according to the Declarations of Helsinki and Venice, or according to the relevant guidelines of the German Drug Law (Arzneimittelgesetz).

Results of the study

Quality of the data

All patients satisfied the selection criteria, with the exception of one polytraumatic

Therapy		Baseline	3rd ... 5th day	13th ... 15th day
Traumeel S	N Mean (StD)	34 - 30.12 (9.868)	34 - 16.15 (8.958)	34 - 2.32 (4.374)
Traumeel Sine	N Mean (StD)	33 - 27.27 (11.281)	33 - 14.55 (8.832)	33 - 2.15 (5.864)
Placebo	N Mean (StD)	34 - 28.69 (9.350)	34 - 18.26 (9.643)	34 - 7.94 (8.866)

Table 6: Reduction in the difference between the maximum muscle force capable of being exerted by the injured side, and the muscle force exerted by the contralateral, noninjured side.

Therapy		Baseline	3rd ... 5th day	13th ... 15th day
Traumeel S	N Mean (StD)	34 4.7 (0.68)	34 2.6 (0.81)	34 1.0 (0.67)
Traumeel Sine	N Mean (StD)	33 4.8 (0.61)	33 2.8 (0.83)	33 0.9 (0.77)
Placebo	N Mean (StD)	34 4.9 (0.33)	34 3.4 (0.95)	34 1.8 (0.96)

Table 7: Pain Index.

Therapy		Date of final examination	Day of resumption of training
Traumeel S	N Mean (StD)	34 14.6 (0.61)	34 12.1 (2.56)
Traumeel Sine	N Mean (StD)	33 14.4 (0.74)	33 12.2 (2.46)
Placebo	N Mean (StD)	34 14.6 (0.55)	34 13.5 (2.25)

Table 8: Date of final examination and date of resumption of athletic training.

	Traumeel S Assessment by		Traumeel Sine Assessment by		Placebo Assessment by	
Effectiveness	Patient (%)	Physician (%)	Patient (%)	Physician (%)	Patient (%)	Physician (%)
Very good	16 (47.1)	8 (23.5)	16 (48.5)	9 (27.3)	6 (17.6)	3 (8.8)
Good	13 (38.2)	17 (50.0)	15 (45.5)	14 (42.4)	11 (32.4)	9 (26.5)
Moderate	5 (14.7)	9 (26.5)	2 (6.1)	9 (27.3)	17 (50.0)	10 (29.4)
Poor	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.0)	0 (0.0)	12 (35.3)
N	34	34	33	33	34	34

Table 9: Assessment of therapeutic effectiveness by patients and physician.

Tolerance	Traumeel S Assessment by Patient	Traumeel S Assessment by Physician	Traumeel Sine Assessment by Patient	Traumeel Sine Assessment by Physician	Placebo Assessment by Patient	Placebo Assessment by Physician
Very good	22	21	21	21	11	11
Good	12	13	12	12	23	23
Moderate	0	0	0	0	0	0
Poor	0	0	0	0	0	0
N	34	34	33	33	34	34

Table 10: Assessment of tolerance to the ointment by patient and physician.

Criteria for tolerance and side effects

Assessment of patient tolerance to the preparations:
At the end of the therapeutic phase, the patients and the physician rated tolerance to the ointment by a number from the following scale: 1 = very good; 2 = good; 3 = moderate; 4 = poor.

In all three therapy groups, both the patients as well as the physician rated tolerance to the ointment as either good or very good. See the data in Table 10.

Undesired side effects

During the entire course of the study, no undesired side effects were observed for any of the patients in any of the three therapy groups.

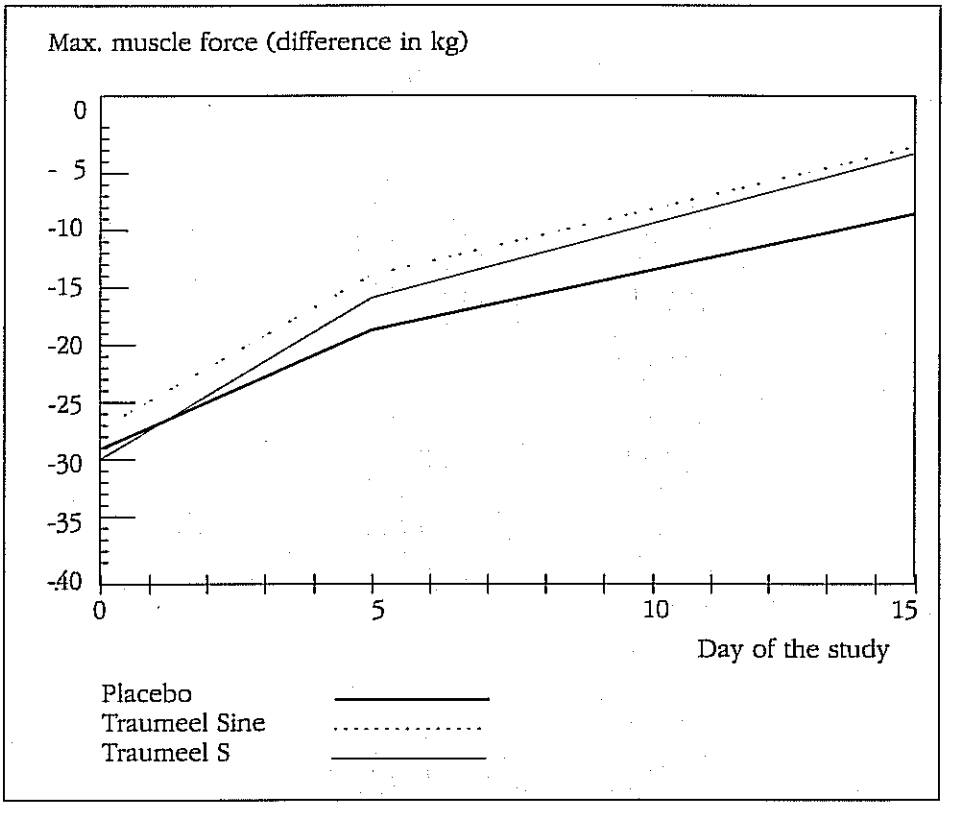

Figure 3: Maximum muscle force in kg: reduction in the difference between injured and noninjured (contralateral) side.

Interpretation of results

The parameters used in this study in the recording of swelling reduction, muscle force, and pain proved to be sufficiently sensitive and reliable in revealing developments in a patient's condition. The pain index proved to be an extraordinarily good measure of such conditions, as revealed by the small values of P and by the Mann-Whitney characteristic P(X<Y) as indicator of relevance.

The time required until resumption of training also proved highly appropriate to indicate the positive or negative success of a medication. The data obtained for this criterion likewise yielded small values of P. On the other hand, skin temperature proved ineffective as an indicator of therapeutic success.

The following may be summarized from the results of this study: the pain index proved to be the most suitable indicator of therapeutic effectiveness. In addition, muscle force, time until resumption of training, and degree of reduction in swelling all similarly proved to be good criteria. These indicators all revealed practically identical therapeutic effects through application of the preparations Traumeel S and Traumeel Sine. Both of these preparations were superior to the placebo. Only the criterion of skin temperature revealed no difference.

Marked differences also resulted from the overall assessment of effectiveness: as a rule, a criterion with a quite sensitive response. Very small values of P resulted here for the distinction with respect to the placebo. The Mann-Whitney characteristics were all less than 0.28, which indicates significant differences.

If a final assessment is made in accordance with a decision model based on strict statistical principles, it is true that superiority is evidenced only for Traumeel Sine in comparison to the placebo for circumference of the injured point on the 15th day. Indeed, confirmatory testing was successful only in that context. A decision strictly on this basis, however, appears excessively narrow, particularly in light of the

Criterion	Test	Data from examination on the 5th day		Data from examination on the 5th day	
		P	P (X < Y)	P	P (X < Y)
Maximum muscle force in kg	Overall	0.2469		0.0052	
	Traumeel S vs. Traumeel Sine	0.3805	0.44	0.4404	0.45
	Traumeel S vs. placebo	0.3361	0.57	0.0070	0.69
	Traumeel Sine vs. placebo	0.1158	0.61	0.0062	0.69
Pain Index	Overall	0.0016		0.0002	
	Traumeel S vs. Traumeel Sine	0.4137	0.45	0.6132	0.53
	Traumeel S vs. placebo	0.0007	0.28	0.0005	0.27
	Traumeel Sine vs. placebo	0.0089	0.33	0.0003	0.26
Resumption of training	Overall			End of therapy P = 0.004	
		P			P (X < Y)
	Traumeel S vs. Traumeel Sine	0.789			0.49
	Traumeel S vs. placebo	0.002			0.31
	Traumeel Sine vs. placebo	0.006			0.32
Overall assessment of effectiveness		By the patient		By the physician	
		P	P (X<Y)	Prt	P (X < Y)
	Overall	0.0002		0.0002	
	Traumeel S vs. Traumeel Sine	0.6571	0.53	0.9462	0.50
	Traumeel S vs. placebo	0.0010	0.28	0.0003	0.25
	Traumeel Sine vs. placebo	0.0001	0.24	0.0007	0.27

Table 5: Compilation of test statistics for the secondary criteria for therapeutic effectiveness.

The mean abatement of swelling was approximately the same for the two Traumeel groups, both on the fifth and on the fifteenth days (see Table 3).

Entirely analogous results were obtained for the reduction of skin-temperature difference between injured and contralateral uninjured sides: i.e., approximately the same reduction in the two Traumeel groups, and less reduction in the placebo group (see Table 4).

Figs. 1 and 2 graphically represent plots of the two primary criteria.

Secondary criteria for effectiveness

The results of test statistics have been compiled in Table 5.

Comparisons among the individual groups for maximum muscle force revealed that the two Traumeel groups were notably superior to the placebo only as verified on the 15th-day examination (global test: P = 0.0052; individual comparisons: P = 0.0070 and 0.0062). The 5th-day test, however, did not manifest advantages for the Traumeel groups (global test: P = 0.2469; individual comparisons: P = 0.3361 and 0.1158).

The individual comparisons for the pain index demonstrated definite superiority of the two Traumeel groups over the placebo: both on the 5th-day examination (global test: P = 0.0016; individual comparisons: P = 0.0005 and 0.0082) as well as on the 15th-day examination (global test: P = 0.0002; individual comparisons: P = 0.0004 and 0.0002).

The individual comparisons showed marked superiority of the two Traumeel groups over the placebo group with respect to the length of time required until resumption of athletic training (global test: P = 0.0004; individual comparisons: P = 0.0002 and 0.0006). Individual group comparisons among the three different therapy groups further revealed the following: no difference between the effects of Traumeel S versus Traumeel Sine ((P = 0.789), very good effectiveness for Traumeel S with respect to the placebo (P = 0.002), and very good effectiveness for Traumeel Sine with respect to the placebo (P = 0.006). Both the assessments of the patients as well as those of the physician for therapeutic effectiveness disclosed definite advantages for the two Traumeel groups over the placebo group (global test: P = 0.0002 for patient evaluation and P = 0.002 for physician's evaluation; individual comparisons: P = 0.0014 and 0.0001 for patients' assessments, and P = 0.0003 and P = 0.0007 for physician's assessment).

Maximum muscle force

In the two Traumeel groups, the maximum muscle force capable of being exerted by the injured side has, after Traumeel therapy, approached the muscle force of the contralateral, non-injured side to a definitely greater degree than the improvement in the placebo group. See Table 6.

Pain index

Data on pain were acquired in the form of a cumulative index value consisting of individual evaluation for the following types of pain: pain at rest, pain upon movement, and pain upon pressure. Each of these three types of pain received a grade from the following scale: 0 = no pain; 1 = slight pain; 2 = severe pain.

In the two Traumeel groups, the mean value for pain index demonstrated definitely greater reduction - both at the 5th-day examination, as well as at the 15th-day checkup - than did the reduction in the placebo group. See Table 7.

Resumption of training

On the average, the patients in the two Traumeel groups were able to resume athletic training sooner than the patients in the placebo group. See Table 8.

Assessment of therapeutic effectiveness

At the end of therapy, the patients and the treating physician separately evaluated the therapeutic effectiveness for each case. The following four-point scale of grading was used: 1 = very good; 2 = good; 3 = moderate; 4 = poor. In this evaluation, both patients and physician judged the two Traumeel preparations to be more effective than the placebo. See Table 9.

Figures 3, 4, 5, and 6 are graphical representations of data results in conjunction with the secondary criteria. Figures 3 and 4 show the plots of mean values. Fig. 5 is a graphical depiction in the form of a Kaplan-Meier Function Plot, and Fig. 6 is a vertical bar graph of the mean values.

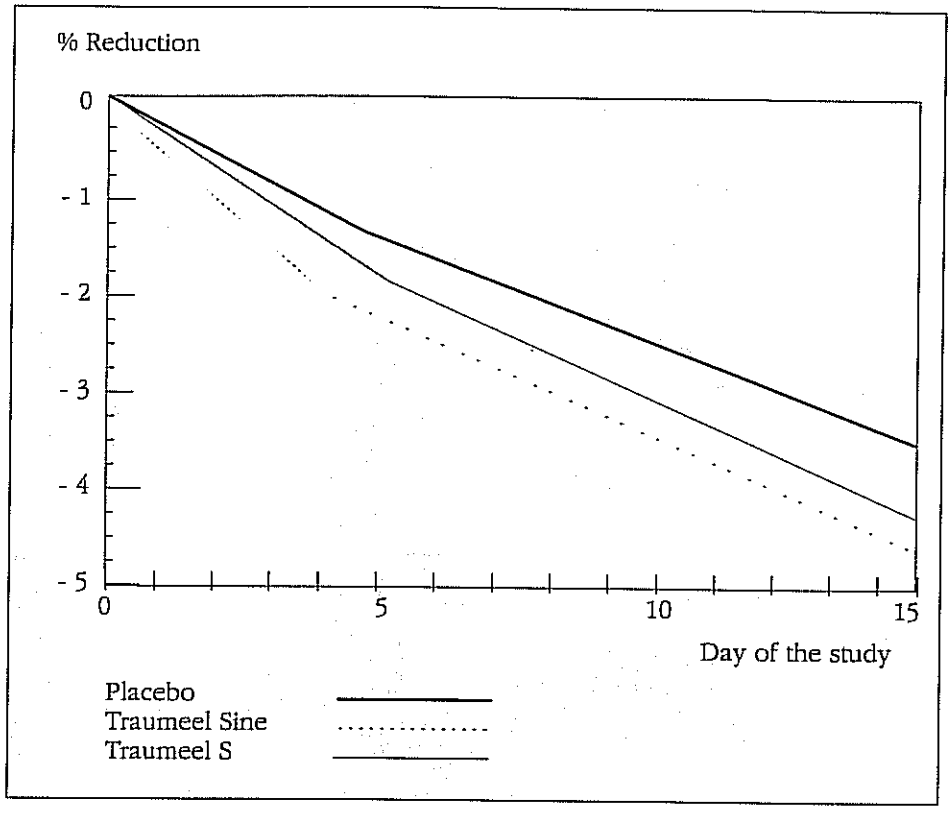

Figure 1: Reduction in swelling as percent of decrease from baseline value.

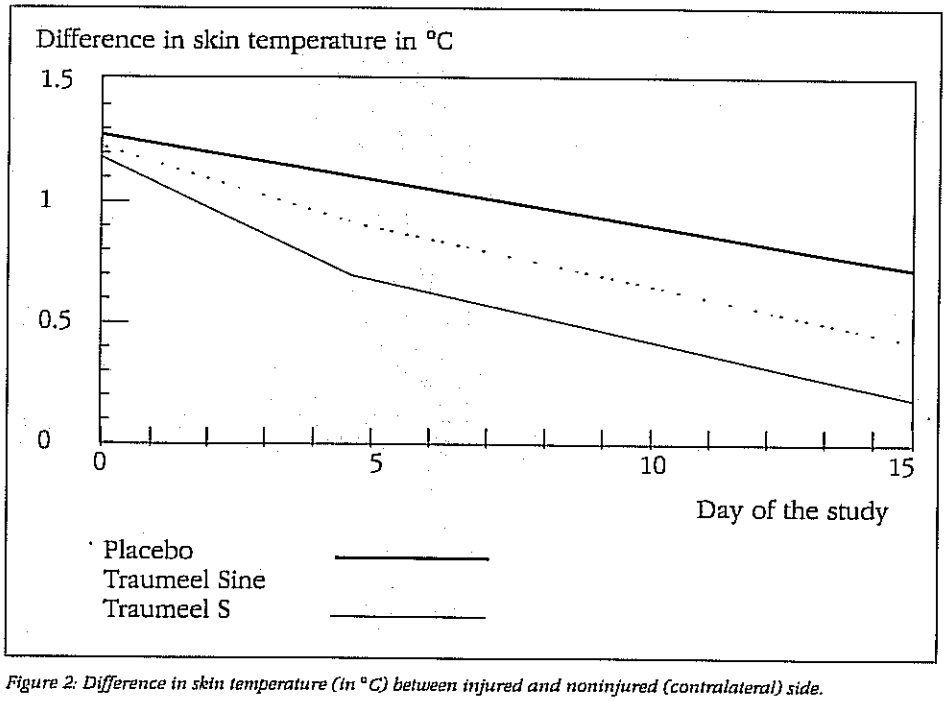

Figure 2: Difference in skin temperature (in °C) between injured and noninjured (contralateral) side.

significant differences revealed for the other criteria - above all, pain index and overall assessment of effectiveness. Under consideration of all data, evidence is indeed convincing for the equivalence of the preparations with active constituents, and for their difference with respect to the placebo group. As the Mann-Whitney characteristics reveal, the differences of the Traumeel preparations with respect to the placebo group are indeed very considerable.

The fact that the data in the study evidenced great differences for both forms of administration of the Traumeel preparation (Traumeel S and Traumeel Sine) over the placebo is also a finding which speaks eloquently for the effectiveness of the preparation: in this way, confirmation of effectiveness of the one preparation supports that of the other. Our one single study, therefore, provides both verification of effectiveness as well as validation for the medication.

It is also interesting to compare the results of this study with those obtained in an earlier investigation conducted by Zell et al. In the Zell study as well, the criterion of skin temperature revealed no therapeutic effects. In Zell, the criterion of swelling was relatively unresponsive; in our study, on the other hand, this criterion was in fact eloquent with respect to therapy, although not as conclusively as the others. In the earlier Zell study, pain upon movement proved to be highly suitable as evidence of effectiveness. In our study as well, pain data in the form of the index value highly effectively revealed the differences between the forms of treatment. Angular measurements of joint articulation, which showed good differentiation in the earlier study, was not used in our work.

On the whole, our study provided highly congruous findings when compared to the earlier, comparable investigation, in confirmation of the effectiveness of the preparations Traumeel S and Traumeel Sine. The conclusions which we reached with respect to the effectiveness of Traumeel S confirm the findings of the earlier study, with good agreement obtained in the conclusions reached for the comparable individual criteria.

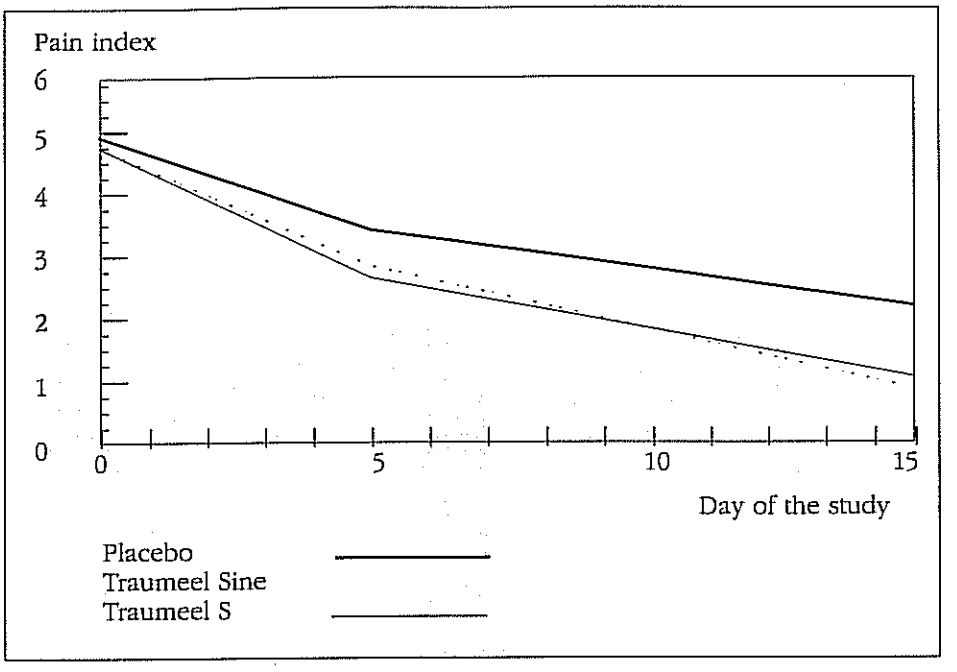

Figure 4: Pain index (cumulative score).

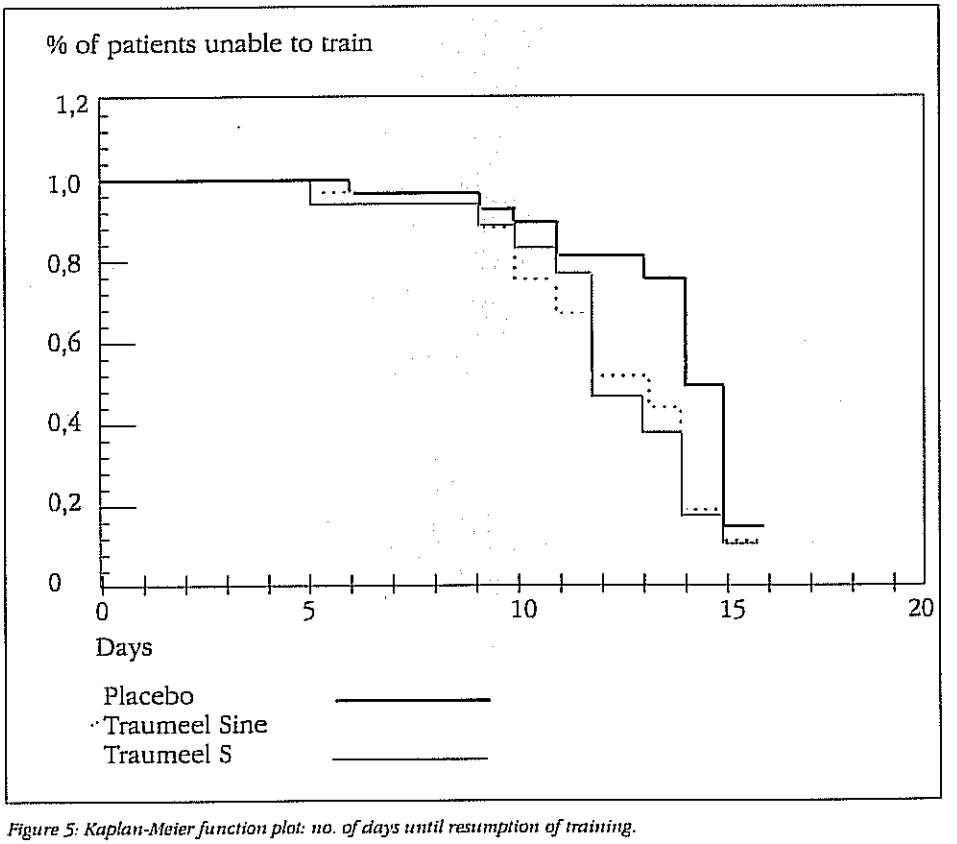

Figure 5: Kaplan-Meier function plot: no. of days until resumption of training.

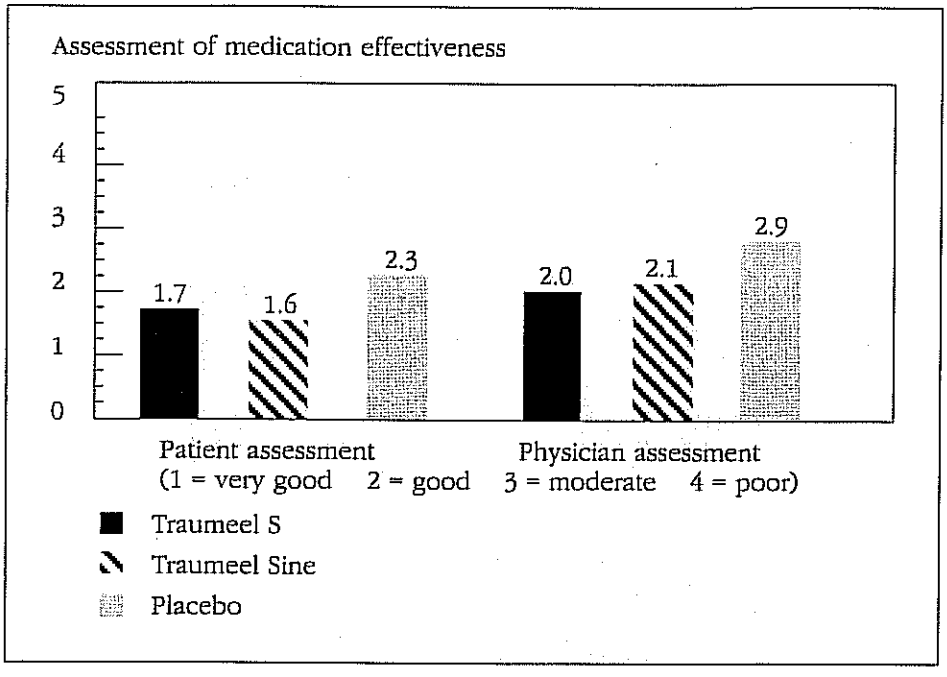

Figure 6: Assessment of effectiveness by patients and the physician (mean values).

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For the authors:
Prof. Dr. med. D. Böhmer
Sportmedizinisches Institut
Otto-Fleck-Schneise 10

D-60528 Frankfurt

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