21 Yano K, Rhoads GG, Kagan A. Coffee, alcohol and risk of coronary heart disease among Japanese living in Hawaii. *N Engl J Med* 1977;297:405-9.
22 Criqui MH. The reduction of coronary heart disease with light to moderate alcohol consumption: effect or artifact? *Br J Addict* 1990;85:854-7.
23 Mikhailidis DP, Jeremy JY, Barradas MA, *et al*. Effect of ethanol on vascular prostacyclin synthesis, platelet aggregation, and platelet thromboxane release. *BMJ* 1983;287:1495-8.
24 Meade TW, Chakrabarti R, Haines AP, *et al*. Characteristics affecting fibrinolytic activity and plasma fibrinogen concentrations. *BMJ* 1979;i:153-6.
25 MacMahon S. Alcohol consumption and hypertension. *Hypertension* 1987;9:111-21.

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Prevalence of primary fibromyalgia in the Finnish population

Matti Mäkelä, Markku Heliövaara

Abstract

***Objective*—To obtain descriptive epidemiological data on fibromyalgia and its components in a representative sample of the Finnish population.**

***Design*—Cross sectional study of 8000 Finns aged 30 or more invited for screening and a main examination for musculoskeletal disorders and other major disorders.**

***Setting*—A mobile clinic.**

***Population*—7217 subjects who attended the screening phase; 3434 subjects positive on screening who attended the main examination for musculoskeletal disorders.**

***Main outcome measures*—Musculoskeletal, mental, and other symptoms detected by interview and questionnaire; results of standardised clinical examination of the musculoskeletal system; operational definition of fibromyalgia; mortality at 10 years.**

***Results*—The prevalence of fibromyalgia was low (54 cases; 0·75%) and related to age (peak prevalence at 55-64 years), female sex (twice as prevalent in women), occupation (no cases among 1596 white collar professionals), level of education (strong inverse gradient), and high levels of physical stress at work. No significant associations were found with body mass index, smoking, or mental stress at work. The prevalence of fibromyalgia was sensitive to even minor modifications of the definition. Fibromyalgia was strongly coincident with many other disorders, especially musculoskeletal conditions. Fibromyalgia did not predict mortality.**

***Conclusion*—Descriptive epidemiological data offer little support for the concept of fibromyalgia.**

Introduction

Fibromyalgia (sometimes called primary fibromyalgia or fibrositis) has been referred to as an independent disease entity or certainly a syndrome.[1] It has been claimed to be highly prevalent and frequently misdiagnosed.[2,3] Clinical descriptions give the impression that it is often severely disabling,[4,5] but most samples are from referral centres and thus subject to a strong selection bias. To our knowledge no one has examined the prevalence of primary fibromyalgia in the general population.

The Social Insurance Institution in Finland has conducted a mobile clinic survey of the health status of a representative sample of the Finnish population aged 30 and over—the mini-Finland health survey.[6] In this paper we use these data to report the distribution and mutual correlations of the components of the primary fibromyalgia syndrome in the Finnish population. Our principal aims were to estimate the prevalence of fibromyalgia and detect determinants of its occurrence.

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Population and methods

The data were collected in 1977-80 as part of the mini-Finland health survey, designed to provide information about the population's health, its need for care and rehabilitation, the consequences of disease, and factors affecting health.[6] The study population was a two stage cluster sample[7] of 8000 people (3637 men, 4363 women) who were representative of all Finnish adults aged 30 years or more. In the first stage 40 regions (mostly single municipalities, of which there are 461 in Finland) were selected to represent the population of Finland with regard to geographical area, degree of urbanisation, and proportion of people employed in industry and agriculture. In the second stage a sample of inhabitants was drawn systematically from the population register of each region.

The examinations were carried out by the mobile clinic of the Social Insurance Institution in two main phases, a screening phase and a main examination phase. A total of 7217 subjects (90·2% of the sample) participated in the screening phase. The distributions of sex, age, marital status, and level of education among the participants corresponded closely with those in the whole Finnish population.[6]

FIELD SURVEY

The screening protocol included several interview items that have been defined as components of the primary fibromyalgia syndrome[1]—namely, reported "hurt all over," enumeration of painful body sites, general fatigue, poor sleep, anxiety and tension, and gastrointestinal problems. The irritable bowel syndrome was not sought specifically. Moderate or severe levels of the symptoms were considered relevant in this study to detect fibromyalgia.

Subjects (n=3775; 52·3%) who in the screening phase reported any moderate or severe musculoskeletal symptoms or had impaired function of at least one joint were invited to a clinical examination to evaluate musculoskeletal morbidity; 3434 (91·0%) attended.[6] They were examined by one of the mobile clinic physicians, and all conditions that satisfied preestablished criteria for major musculoskeletal disorders were independently recorded. Although this examination was initially not designed to detect primary fibromyalgia, it included a systematic recording of pressure tenderness in the wrists, elbows, trapezoid muscles, shoulder joints, knee joint region, and Achilles tendons. These represent many but not all of the points suggested in previous studies of fibromyalgia.

Other illnesses were also screened for and were investigated separately by similar diagnostic procedures. Mental disorders were sought by the general health questionnaire[8,9] and diagnosed by the present state examination and a computerised coding algorithm (CATEGO-ID).[10]

Deaths among the study population were traced to the end of 1989 by linkage with the Finnish population register. Ascertainment was complete.

DIAGNOSIS OF FIBROMYALGIA

For most analyses we used an operational definition of fibromyalgia adapted from Yunus *et al*.[1] This

required at least two out of six items of symptom history combined with at least four tender points, or at least three symptom items combined with at least two tender points. Only subjects reporting pain in several regions lasting at least three months were included. All subjects with an inflammatory polyarthritis or spondylarthritis were excluded, as were all subjects with painful degenerative joint disorders in the knees, hips, hands, and shoulders (three regions out of four required for exclusion). This was labelled the Yunus set.

The sensitivity of the criteria to modification was investigated by applying three other, slightly modified sets of criteria. Firstly, the Yunus criteria were simplified by requiring a combination of three or more symptom items with three or more tender regions (modified set 1). Secondly, less strict criteria of two or more symptom items and two or more tender regions were applied (modified set 2). Thirdly, generalised pain (count of painful regions exceeding six or the subject reporting moderate or severe pain all over) and three or more tender regions were required, approximating the criteria used by Cathey *et al*[3] (modified set 3). An explicit report of longlasting pain was required for the modified criteria and the same conditions excluded as from the Yunus set.

TABLE I—*Prevalence of fibromyalgia (Yunus criteria) among Finns aged 30 or more by demographic and other determinants*

Subgroup	No of subjects	No with fibromyalgia	Prevalence of fibromyalgia	p Value
All	7217	54	0·75	
Sex:				
Men	3322	16	0·48	0·038 (Adjusted for age only*)
Women	3895	38	0·98	
Age (years):				
30-44	2716	2	0·07	
45-54	1609	14	0·87	<0·0001 (Adjusted for sex only*)
55-64	1348	19	1·41	
65-74	1078	13	1·21	
≥75	466	6	1·29	
Level of education:				
Less than elementary	736	20	2·72	0·0001*
Elementary	4169	31	0·74	
Secondary	1506	3	0·20	
High school or more	806	0	0	
Occupational class:				
Professional	1596	0	0	0·004 (Mantel-Haenszel test*)
Agriculture	1688	25	1·48	
Industry	1743	8	0·46	
Services	1811	14	0·77	
Never employed	379	7	1·85	
Body mass index (kg/m²):				
<23	1816	5	0·28	0·123*
23-26	2203	17	0·77	
27-29	1737	15	0·86	
30-32	898	13	1·45	
33-35	375	3	0·80	
>35	188	1	0·53	
Smoking:				
Never smoker	4009	31	0·77	0·127*
Ex-smoker	1505	13	0·86	
Current smoker	1703	10	0·59	
Physical work stress:				
Very low	1895	8	0·42	0·031*
Intermediate	1433	7	0·49	
High	3889	39	1·00	
Mental work stress:				
Very low	2780	27	0·97	0·99*
Intermediate	1964	8	0·41	
High	2473	19	0·77	

*Significance tests (likelihood ratio statistics) of associations based on logistic regression models adjusting for age and sex if not otherwise specified.

TABLE II—*Distribution of components of Yunus's criteria for fibromyalgia syndrome among subjects with and without syndrome*

	Subjects without fibromyalgia (n=7163)		Subjects with fibromyalgia (n=54)	
	No	%	No	%
Tender points:				
Unknown	3783	52·8	0	0
None	2343	32·7	0	0
1	708	9·9	0	0
2	197	2·8	31	57·4
3	67	0·9	15	27·8
4	25	0·4	6	11·1
5	21	0·3	1	1·9
6	6	0·1	0	0
7	9	0·1	1	1·9
8	1	<0·1	0	0
9	2	<0·1	0	0
10	1	<0·1	0	0
Painful body regions:				
None	2451	34·2	0	0
1	1759	24·6	0	0
2	1143	16·0	0	0
3	703	9·8	0	0
4	444	6·2	10	18·5
5	257	3·6	9	16·7
6	146	2·0	9	16·7
7	101	1·4	12	22·2
8	71	1·0	4	7·4
9	50	0·7	6	11·1
10	38	0·5	4	7·4
"Hurt all over"	1388	19·4	49	90·7
General fatigue	739	10·3	42	77·8
Poor sleep	428	6·0	22	40·7
Anxiety and tension	1199	16·7	30	55·6
Abdominal trouble	776	10·8	21	38·9
Number of symptom items:				
None	4419	61·7	0	0
1	1505	21·0	0	0
2	709	9·9	2	3·7
3	318	4·4	30	55·6
4	151	2·1	16	29·6
5	57	0·8	4	7·4
6	4	0·1	2	3·7

STATISTICAL METHODS

In addition to simple descriptive tabulation, logistic regression models[11] were fitted to investigate the association of fibromyalgia with several possible determinants and with other disorders. The κ statistic was used to estimate the concordance between the different sets of criteria. Cox's proportional hazards model[12] was used to assess the effect of fibromyalgia on survival.

Results

Table I shows the crude prevalence of fibromyalgia according to the Yunus criteria. It also shows the prevalence by sex, age, level of education, present or previous occupation, smoking, body mass index (weight/height²; kg/m²), and history of physical and mental stress at work (present or previous).

In a multivariate analysis of the possible determinants of fibromyalgia, adjusting for age and sex, only the level of education was significant, overwhelming the associations with occupational class and physical stress at work. The odds ratio associated with education was 0·29 (95% confidence interval 0·18 to 0·49), referring to the ratio of two adjacent educational levels. Thus the odds ratio contrasting the highest level (3) with the lowest level (0) was $0{\cdot}29^3=0{\cdot}024$. This accords with table I, which shows that there were no cases among subjects with a high school or equivalent education and no cases even among the twice larger group of professional white collar employees.

Table II shows the prevalence of symptom items and counts of painful body regions, tender points, and positive symptom items among subjects with and without fibromyalgia. The findings showed no bimodality or any obvious upper level of a non-pathological distribution.

Table III shows that the prevalence of fibromyalgia was highly dependent on the specific configuration of criteria. Applying the modified set 1 led to an even lower prevalence than the Yunus set, and disagreement between any two sets of criteria was high.

Though all criteria excluded chronic conditions giving similar symptoms, morbidity was much higher among the fibromyalgia group than in the rest of the population. Table IV shows that fibromyalgia was associated with a high risk of having a mental disorder, and all subjects fulfilling the criteria for fibromyalgia also fulfilled the criteria for at least one other musculoskeletal disorder (excluding the conditions defined above).

By the end of 1989, 12 of the 54 subjects with

TABLE III—*Prevalence of fibromyalgia according to varying sets of criteria, and correspondence (κ statistic) of different sets*

	No of cases	% Prevalence	Correspondence of sets (κ) Set 1	Set 2	Set 3
Yunus criteria*	54	0·75	0·56	0·79	0·43
Modified set 1†	21	0·29		0·40	0·57
Modified set 2‡	83	1·15			0·48
Modified set 3§	52	0·72			

All sets—Inflammatory polyarthritis, spondylarthritis, and generalised osteoarthritis excluded. Only subjects with pain lasting at least three months included.
*Yunus's criteria: (*a*) at least two symptom items and four tender points or (*b*) at least three symptom items and two tender points.
†Modified set 1: at least three symptom items and three tender points.
‡Modified set 2: at least two symptom items and two tender points.
§Modified set 3: (*a*) at least three painful body regions or "hurt all over" and (*b*) at least three tender points.

TABLE IV—*Prevalence of certain disorders and their relative risks (odds ratios and 95% confidence intervals), adjusted for age and sex, as determined by fibromyalgia*

	Subjects without fibromyalgia (n=7163) No	%	Subjects with fibromyalgia (n=54) No	%	Odds ratio (95% confidence interval)
Osteoarthritis	1131	15·8	43	79·6	15·5 (7·5 to 32·2)
Knee osteoarthritis	747	10·4	35	64·8	11·4 (6·1 to 21·3)
Hip osteoarthritis	362	5·1	7	13·0	1·7 (0·7 to 3·8)
Hand osteoarthritis	343	4·8	9	16·7	2·1 (1·0 to 4·5)
Chronic low back pain	1227	17·1	26	48·1	3·5 (2·1 to 6·1)
Chronic neck pain	844	11·8	26	48·1	4·9 (2·8 to 8·5)
Shoulder disorder	409	5·7	19	35·2	6·1 (3·4 to 10·8)
Any musculoskeletal disorder	2945	41·1	54	100·0	Indeterminate
Any circulatory disorder	2053	28·7	22	40·7	1·0 (0·5 to 1·7)
Any respiratory disorder	1222	17·1	15	27·8	1·9 (1·0 to 3·5)
Any other major somatic disorder	1570	21·9	19	35·2	1·3 (0·8 to 2·4)
Any mental disorder	1255	17·5	30	55·6	4·8 (2·8 to 8·4)

fibromyalgia had died (22·6/1000 person years) as compared with 1202 of the 7163 subjects without fibromyalgia (16·6/1000 person years). This difference was not significant when adjusted for sex and age in a proportional hazards model (relative risk 0·90, $\chi^2=0·14$, df=1, p=0·71).

Discussion

A weakness of this study was that fibromyalgic tender points were not tested systematically. Authorities on fibromyalgia cite evidence that the tender point phenomenon is strictly local and not one of a generally lowered pain threshold,[2] so tender points might easily have been missed by the examiners in our study. The effect would be for us to have underestimated the occurrence of fibromyalgia in the community. The symptom items alone, however, restricted the possible prevalence to 5%, and any tender point criterion was bound to have reduced this down to the range that we observed.

Another question is the number of patients with fibromyalgia who were missed because of a faulty screening procedure. The number of subjects with three or more items of symptom history suggestive of fibromyalgia who did not attend the medical examination and were not excluded by the exclusion criteria was 20. The positive predictive value of the symptom criterion was 15% among those attending the medical examination. Therefore, probably not more than four of these would have fulfilled the tender point criterion. Hence faulty screening would not have produced a grossly biased prevalence estimate.

Our results suggest that the prevalence of fibromyalgia in the general population at any given time is very low. This might be due to either a low incidence or a short duration of the disorder. The symptoms and disability associated with fibromyalgia have been claimed to be highly stable over at least a year,[5] supporting the hypothesis of a low incidence. Moreover, the mean duration of symptom history among patients has been as high as 12 years.[3] On the other hand, the lower prevalence that we found among elderly as compared with middle aged people suggests that most of these patients eventually either get better or develop some other, more specific disease to account for their symptoms.[13]

We found a strong association of fibromyalgia with a low level of education. In contrast, the patients described by Cathey *et al* had an educational level above that of the general population. This disparity may have been due to selection bias in the hospital series.

Usually when an association is found between the level of education and an illness it is better explained by variables that are closer to disease causation, such as exposure to occupational hazards. In the case of fibromyalgia no such intervening variables were noted. But this does not mean that deficient education contributes to the development of fibromyalgia in any biological or clinical sense. Possibly the expression of pain varies with the level of education, leading to the gradient in the prevalence that we observed.

The diminished prevalence among the elderly could have been caused by an increased mortality. Also, if some subjects with fibromyalgia later develop serious disorders[13] we should expect an increased mortality. But we did not observe this. One reason may be that our study base was the general population whereas a series of patients from a referral centre probably includes a high proportion regarded by their primary care physicians as patients who "seem sick."

The fibromyalgia syndrome seems to have no effect on longevity. No theoretical or distributional reasons are evident for its criteria. No description of a specific natural course or specific response to treatment has been reported. The prevalence and distribution in any given study population will be determined not only by the selection of the study base (referred hospital patients, primary health care clients, general population, etc) but also on the arbitrary choice of diagnostic criteria.

Descriptive epidemiological data lend little support to the notion of an independent syndrome of fibromyalgia. Rather, it seems that the extreme ends of the different (although correlated) dimensions of illness, pain, and mental distress sometimes result in such a complex picture of suffering, perhaps as a general response to any of several possible influences.[14]

Two phenomena have been quoted as specific proof of the biological nature of fibromyalgia. These are the local tenderness of the tender points[2] and an α electroencephalographic sleep anomaly.[15] Their distribution, correlates, and possible significance in the general population have not been described. These phenomena may equally well be non-specific manifestations of any extreme distress state as components of an independent syndrome.

Fibromyalgia resembles a constellation of stars: its components are real enough but the pattern is in the mind of the beholder. That ancient Greeks gave a group of stars the name of a mythical being is not reason enough to suppose that the constellation has any actual meaning, much less the attributes of the creature.

1 Yunus MB, Masi AT, Aldag JC. Preliminary criteria for primary fibromyalgia syndrome (PFS): multivariate analysis of a consecutive series of PFS, other pain patients, and normal subjects. *Clin Exp Rheumatol* 1989;7:63-9.
2 Campbell SM, Clark S, Tindall EA, Forehand ME, Bennett RM. Clinical characteristics of fibrositis. I. A "blinded," controlled study of symptoms and tender points. *Arthritis Rheum* 1983;26:817-24.
3 Cathey MA, Wolfe F, Kleinheksel SM, Hawley DJ. Socioeconomic impact of fibrositis. A study of 81 patients with primary fibrositis. *Am J Med* 1986;81(suppl 3A):78-84.
4 Yunus M, Masi AT, Calabro JJ, Miller KA, Feigenbaum SL. Primary fibromyalgia (fibrositis): clinical study of 50 patients with matched normal controls. *Semin Arthritis Rheum* 1981;11:151-71.

5 Hawley DJ, Wolfe F, Cathey MA. Pain, functional disability, and psychological status: a 12-month study of severity in fibromyalgia. *J Rheumatol* 1988;15:1551-6.
6 Aromaa A, Heliövaara M, Impivaara O, Knekt P, Maatela J. *The execution of the mini-Finland health survey. Part 1.* Helsinki, Turku: Social Insurance Institution, 1989. (ML:88. In Finnish with English summary.)
7 Kish L. *Survey sampling.* New York: Wiley, 1965.
8 Goldberg D. *The detection of psychiatric illness by questionnaire.* London: Oxford University Press, 1972. (Maudsley Monograph 21.)
9 Takala J, Räkköläinen V, Salminen J, Sievers K. Mental health in the middle-aged population. *Acta Psychiatr Scand* 1979;59:294-305.
10 Wing JK, Cooper JE, Sartorius N. *The measurement and classification of psychiatric symptoms.* London: Cambridge University Press, 1974.
11 Haberman SJ. *Analysis of qualitative data.* Vol 1. *Introductory topics.* New York: Academic Press, 1978.
12 Cox DR. Regression models and life tables (with discussion). *Journal of the Royal Statistical Society (B)* 1972;74:187-220.
13 Forslind K, Fredriksson E, Nived O. Does primary fibromyalgia exist? *Br J Rheumatol* 1990;29:368-70.
14 Goldenberg DL. Fibromyalgia and other chronic fatigue syndromes: is there evidence for chronic viral disease? *Semin Arthritis Rheum* 1988;18:111-20.
15 Moldofsky H. The contribution of sleep-wake physiology to fibromyalgia. In: Fricton JR, Awad EA, eds. *Advances in pain research and therapy.* Vol 17. *Myofascial pain and fibromyalgia.* New York: Raven Press, 1990.

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Efficacy of fixed minidose warfarin prophylaxis in total hip replacement

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Abstract

***Objective*—To determine whether a small fixed perioperative dose of warfarin would prevent deep vein thrombosis after total hip replacement.**

***Design*—Prospective, randomised, double blind placebo controlled trial.**

***Setting*—Winford Orthopaedic Hospital, Bristol.**

***Subjects*—148 patients having primary total hip replacement.**

***Intervention*—Warfarin 1 mg given daily for one week before and three weeks after surgery.**

***Main outcome measure*—Deep vein thrombosis diagnosed by the iodine-125 labelled fibrinogen uptake method.**

***Results*—Deep vein thrombosis occurred in 25 (34%) of the patients given warfarin and 19 (26%) of the controls (difference 8%; 95% confidence interval −6·8% to 22·8%).**

***Conclusion*—Fixed minidose warfarin does not prevent deep vein thrombosis after total hip replacement.**

Introduction

The incidence of thromboembolism is particularly high after total hip replacement. Deep vein thrombosis occurs in up to 70% of patients.[1] The incidence of the postphlebitic limb syndrome complicating thrombosis after hip replacement is unknown but may be as high as 51%, which occurs after long bone fractures.[2] Subclinical pulmonary emboli occur in up to 23% of patients,[3] and 1-2% of patients die of pulmonary embolism.[4]

Many prophylactic regimens have been described but none have proved ideal and there is no consensus on the most suitable prophylaxis.[5] Several studies found that low dose heparin was effective,[6,7] but Sikorski *et al* suggested that this regimen may only delay the onset of thromboembolic complications, describing a rebound surge in thromboembolism once heparin was stopped.[8] Other studies found low dose heparin to be ineffective.[9,10] Conventional full dose anticoagulation begun before surgery is highly effective in preventing thromboembolism[11] but has never been widely accepted because of the risks.[4]

A recent report of the success of fixed minidose warfarin in gynaecological patients[12] prompted us to test its efficacy after total hip replacement. The advantages of this simple regimen were that there were no haemorrhagic complications; prescription was by a daily fixed dose; and prophylaxis was continued after discharge from hospital, covering the period when 60% of fatal pulmonary emboli are likely to occur.[11]

Patients and methods

The study was modelled on projected estimations from the report of Poller *et al.*[12] We were seeking to detect a reduction in deep vein thrombosis from 50% to 20%. For the power of the study $(1-\beta)$ to reach 90% we required 75 patients in each group.

One hundred and forty eight patients who were having primary total hip replacement were randomly allocated to either the treatment group or the control group. The treatment group received 1 mg warfarin daily for one week before and three weeks after surgery. The control group received placebo for the same period. Randomisation was achieved by the use of random number tables by the hospital pharmacy, which prepared the tablets in foil packets. Thus neither the patients nor the investigators were aware of which group the patient was in. Prothrombin time, activated partial thromboplastin time, platelet count, and haemoglobin concentration were assessed at two weeks and at 24 hours preoperatively and 48 hours postoperatively. Patients were excluded if there was a history of thromboembolism or a medical contraindication to warfarin. Smoking history was not recorded. All patients gave fully informed consent.

All the hip arthroplasties were performed in the lateral decubitus position by either the posterior or direct lateral approach. Patients received a standardised general anaesthetic. Wounds were closed with subcuticular suture. Two 6 mm suction drains were used. Intraoperative blood loss was estimated and postoperative drainage and the volume of blood transfused were recorded.

Diagnosis of deep vein thrombosis—All patients were screened for deep vein thrombosis by the iodine-125 labelled fibrinogen uptake method.[10,13] The thyroid was protected by oral potassium iodide (100 mg daily). Each patient received 3·7 MBq (100 μCi) ^{125}I-fibrinogen on the morning after surgery. Daily scanning of radioactivity at nine points[13] on both legs[10] was performed either until discharge or until two weeks postoperatively. Deep vein thrombosis was diagnosed in the calf or popliteal veins when the ^{125}I-fibrinogen count was raised by at least 20% over one or more points and this increase persisted over two consecutive days. Any suspected thrombosis in the femoral vein was further investigated by phlebography as postoperative haematoma may cause a false positive increase in radioactivity in that region. Patients with thrombosis in the popliteal vein or more proximally received full anticoagulant treatment.

Wound complications—All wounds were inspected and scored clinically at one week. Wounds were judged to be clean, moist, or inflamed. Haematomas were sought with a real time ultrasound machine with a

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