

Overweight predisposes to coxarthrosis

Body-mass index studied in 239 males with hip arthroplasty

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In a case-control study, body-mass index (BMI) at aged 20, 30, 40, and 50 years was studied in 239 men who had just received a hip prosthesis because of coxarthrosis and in 302 controls randomly selected from the general population. Information about weight, occupational physical load, sports activities, smoking, and many other

factors was self-reported in a questionnaire. Men with a BMI > the mean BMI + 1 SD had an increased relative risk of developing severe coxarthrosis as compared with men with a BMI < the mean BMI -1 SD. Those slightly obese at the aged 40 years had a relative risk of 2.5 for later surgery of the hip.

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Obesity has been shown to be associated with generalized osteoarthritis, as well as gonarthrosis (Kelsey 1982). The results in earlier studies are inconclusive for coxarthrosis (Saville and Dickson 1968, Kraus et al. 1978, Hartz et al. 1986). Most investigations are cross-sectional; and in those positive, it is unclear whether obesity causes arthrosis or whether arthrosis causes obesity. In a recently reported prospective cohort study from Finland (Rissanen et al. 1990) that was based on data from health examinations of 12,053 women and 19,076 men between 1966 and 1972 and a follow-up until 1982, there was an increased relative risk of receiving a disability pension because of coxarthrosis and gonarthrosis by those with an increased body-mass index.

A case-control study of overweight, calculated as body-mass index, as an etiologic factor for coxarthrosis is reported.

Study population and methods

The study population included all the Swedish men aged 40 to 70 years old residing in the referral areas of four hospitals in Stockholm during the period October 1984 to June 1988.

The probands were those men in the study population who underwent an arthroplasty because of primary coxarthrosis. Weekly, the orthopedic clinics involved provided the names and addresses of newly operated on patients. The controls were randomly selected from the register of the general population on four different occasions during the

study period. In both groups, individuals were excluded who had malformations, sequelae after poliomyelitis, rickets, or trauma to the trunk and the lower extremities.

The probands and the controls received an introductory letter; and a few days later, they were contacted by telephone. Those interested in participating in the study were interviewed about their health status, smoking habits, education, height, sports activities, and occupational career. Based on the telephone interview, the occupational career was divided into different periods with similar work tasks as regards physical work load. For each such period, the proband was asked to complete a questionnaire about the specific load in that type of work and his weight during that period. If the questionnaires were not returned, two reminders were sent.

The contact with the hospitals, the telephone calls, and the interviews were performed by the same nurse during the whole investigation. Only persons with informations about weight, height, and complete occupational history were included in the analysis.

The probands were 259 men. Five could not be reached by telephone, 1 did not want to participate, and 14 did not return their questionnaires but answered the questions during the telephone interview. Totally, 239 cases (92 percent) participated in the entire study and 253 (98 percent) in parts of the study. Slightly more than one third of the participants had bilateral coxarthrosis.

The control group consisted of 392 men. Thirty-eight could not be reached by telephone, 32 did not

Table 1. Number of participants (percentage) in different age groups

Age (yrs)	Probands	Controls
40-49	6 (2)	0
50-59	53 (21)	75 (23)
60-70	194 (77)	247 (77)
Total	253	322

Table 3. Smoking habits of the participants (percentage)

	No information	Never smoked	Ex-smokers	Smokers
Probands	1	36	36	27
Controls	0	34	38	28

Table 2. The educational background of the participants (percentage)

	Elementary school	Secondary school	University
Probands	43	45	12
Controls	37	48	15

Table 4. Self-reported values for a representative sample of the adult male Swedish population at different ages (Kukowska Wolk et al. 1989)

Age	mean BMI	SD
20	22.2	1.61
30	23.5	1.69
40	24.4	1.83
50	25.1	2.35

Table 5. The number of proband (P) and control (C) persons in the different BMI groups at different ages

Age (yrs)	20		30		40		50	
	P	C	P	C	P	C	P	C
< Mean BMI -1 SD	32	44	31	52	35	75	37	72
Mean BMI -1 SD	85	107	116	154	124	153	118	174
> Mean BMI +1 SD	36	37	48	39	43	33	23	18
> Mean BMI +2 SD	31	21	27	29	17	14	7	5
Information unavailable ^a	55	93	17	28	20	27	54	33

^aInformation unavailable as regards height, weight, or occupation.

want to participate, and 20 did not return their questionnaires but answered the questions during the telephone interview. In all, 302 controls (77 percent) participated in the whole study and 322 (82 percent) in parts of the study.

Age distribution, educational level, and smoking habits among the participants are shown in Tables 1-3. The Swedish average rates for body-mass index have been assigned to self-reported weight and height for 7,065 men between 16 and 84 years of age (Kuskowska-Wolk and Rössner 1990; Table 4).

Statistics

The relative risks were estimated by the odds ratios. Allowance was made for potential confounding factors—such as age, smoking, and occupational and sports-related physical loads—with stratified analysis using the method proposed by Mantel and Haenszel (1959). Confidence intervals of 95 percent

for the relative risks were calculated using the test-based method (Miettinen 1976). A logistic regression analysis was also used to calculate the importance of different exposures.

Results

The probands were heavier than the controls from aged 20 to 50 years. A few were grossly overweight, i.e., > the mean BMI + 2 SD (Table 5). The relative risks of developing coxarthrosis by persons with a BMI more than 1 SD over the mean BMI as compared with those with a BMI less than 1 SD under the mean BMI were increased in all the age groups, with the highest value 2.49 (95 percent CI 1.39-4.47) for those overweight at aged 40 years (Table 6). Allowance was made for age, smoking, and physical loads from occupation and sports, and there were very few changes between the crude and adjusted values.

Table 6. The relative risk (RR) adjusted for age, smoking habits, and occupational physical work load between aged 30 and 40 years for persons with a BMI > the mean BMI +1 SD at different ages of having a severe coxarthrosis later in life as compared with persons with a BMI < the mean BMI -1 SD

Age	RR	95% confidence limit
20	1.67	0.90-2.97
30	1.81	1.02-3.23
40	2.49	1.39-4.47
50	2.32	1.22-4.40

Discussion

In this study, increased body-mass index at aged 20, 30, 40, and 50 years gave an increased relative risk of developing severe coxarthrosis. Body-mass index (BMI) is weight related to height, and it does not indicate anything about the amount and distribution of fat. Large muscles may be responsible for an increased BMI. At the extremes, very muscular persons can be classified as overweight or even obese and persons with abdominal fatness as normal or underweight. In the absence of an examination and metabolic investigation of every participant, the body-mass index was used as a parameter of overweight or obesity.

If obese persons have surgery earlier than persons with normal weight, the risks are overestimated. However, obesity is a relative contraindication for elective surgery. The body-mass indexes reported were moderately elevated, and the studied groups do not contain a large number of very obese persons, but quite normal men and few extremes. Men with rather great weight problems and coxarthrosis might have been refused hip prosthesis surgery, and the relative risks reported here are then underestimated.

Only persons with such a severe coxarthrosis that they had undergone surgery were included as probands in this study. If there was anything in the medical records or in the interview of a person that indicated secondary osteoarthritis, he was excluded. The borderline between primary and secondary coxarthrosis is diffuse, and a nondifferential misclassification of diagnosis might have occurred (Norell 1987).

All the information in this study was self-reported. Evaluation of self-reported versus objectively measured weight has been performed in several studies (Schlichting et al. 1981, Stewart 1982, Kuskowska-Wolk et al. 1989, Kuskowska-Wolk and Rössner 1989). The common finding is that heavy subjects underestimate their weight and

thin individuals overestimate theirs. This follows the so-called flat-slope syndrome known from sociologic research: namely, interviewed persons tend to underestimate high values and overestimate low ones. In our present study, such a misclassification would give wider confidence limits, but it would not interfere with the point estimate of the relative risks. Further, the mean rates used for BMI classification are self-reported data (Kuskowska-Wolk and Rössner 1990).

To remember ones weight far back in time is difficult. If the probands, but not the controls, considered themselves lighter than they really were, the relative risks are underestimated in our study and vice versa. Such a differential misclassification is, however, not very likely. The time lapsed between the exposure and the recall has been considered a more important indicator of the accuracy of recall than case or control status (Rothman 1986). Hospital referents have been used as controls for memory bias between groups, but such a procedure might introduce other validity problems. In different studies, this type of recall bias has been shown to be of almost no significance (Norell and Ahlbom 1987). Besides, the subjects in this study had to answer a lot of questions where weight was not an essential one. A nondifferential misclassification is more probable, and gives a dilution towards unity as regards the relative risk.

Coxarthrosis of the hip increases with increasing age. The analyses were made after stratifying the participants into three age groups: aged 40-59, 60-64, and 65-70 years. Smoking might contribute to degenerative disorders of the spine (Biering-Sørensen and Thomsen 1986), and the analyses were made by stratifying into two groups for smoking habits: current and not current smokers. Physical work load and load from sport activities have been discussed as a risk factor for coxarthrosis (Felton 1988), and persons working in heavy occupations and engaging in strenuous sports activities might have an increased BMI due to increased musculature as compared with persons in sedentary occupations.

Information about this exposure was available for all the persons in this study. The BMI results were stratified for physical work load of both dynamic and static origins, as well as for total hours of sports activities, on three exposure levels—high, medium, and low. Life-long information of total physical load exposure in occupation and sports, though obtained retrospectively, has never been analyzed before for persons with coxarthrosis as compared with healthy individuals and will be reported separately. In a logistic regression analysis, age, physical load from

occupation and sports, and body-mass index seem to be independent risk factors not confounders.

Elevated body-mass indexes from aged 20 years to aged 50 years seem to increase the risk of developing a severe coxarthrosis. Whether or not the cause of the arthrosis is due to the load from the overweight, is of metabolic origin, or is of any other origin has not been determined in this study.

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