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ORIGINAL ARTICLE

Prevalence of asymptomatic rotator cuff tear and their related factors in the Korean population

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Background: No information is available about asymptomatic rotator cuff tears (RCTs) in the Korean population. This study evaluated the prevalence of rotator cuff tears without symptoms and their related risk factors.

Materials and methods: The study included 486 volunteers (70.4% female; mean age, 53.1; range, 20-82 years) without any shoulder symptom complaints. Background data, medical history, clinical self-assessment, and physical examination were recorded. An ultrasonographic examination was conducted to identify rotator cuff pathology, but only full-thickness RCTs (FTRCTs) were included for the statistical analysis.

Results: FTRCTs were found in 23 subjects (4.7%) but only in those aged ≥49 years. Subjects aged 50-59, 60-69, and ≥70 years of age had FTRCT prevalence rates of 3.5%, 13.3%, and 11.1%, respectively. The prevalence of FTRCTs was higher in subjects with diabetes ($P = .042$) and a smoking history ($P = .002$), but no differences were noted for the presence of thyroid disease ($P = .051$). Almost half of those who had FTRCTs had some pain and limited daily activity that was not bothersome. After excluding these subjects from the analysis, the prevalence of asymptomatic FTRCTs decreased to 2.3%.

Conclusions: The prevalence of asymptomatic FTRCTs was lower than expected. Half of asymptomatic FTRCTs were not actually symptom free after the clinical and physical assessments. The risk factors for a FTRCT were age, diabetes, and smoking.

Level of evidence: Level III; Cross-Sectional Design; Epidemiology Study

Keywords: Rotator cuff tear; asymptomatic; prevalence; ultrasonography; related factors; Korean population

Although a rotator cuff tear (RCT) is one of the most common disorders affecting the shoulder in the middle-aged or older-aged population, many of them do not complain of any pain or disability. Numerous studies report that the asymptomatic RCT is not rare; however, the prevalence of

The Institutional Review Board of St. Vincent's Hospital, the Catholic University of Korea, approved this study (Study No.: VC11EIMI0066).

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RCT varies from 7% to 72%, depending on the study.[11,24,28] The prevalence of asymptomatic RCTs was reported to increase with age from a prevalence of 13% among subjects aged 50 to 59 years to 51% among those aged 80 years and older.[23] Yamaguchi et al[25] reported that the prevalence of RCT is age-dependent and that the average age is 58.7 years for partial RCT and 67.8 years for complete RCT. Other risk factors, including diabetes, smoking history, and thyroid disease, have also been reported to be associated with RCT.[1,4,16,23,25-27]

Although many studies on asymptomatic RCTs have been published,[2,6,7,9,11-15,18,19,23-27] the present study is the first study on asymptomatic RCTs among the Korean population. Our hypotheses were that asymptomatic RCTs would not be rare, as many studies have reported, and that asymptomatic RCTs would be increased with age and risk factors such as diabetes, thyroid disease, and smoking history.

Materials and methods

This study included 972 shoulder joints from 486 volunteers who visited the orthopedic outpatient clinic or who were admitted to orthopedic wards between June 1, 2011, and November 30, 2012, with problems other than those with the shoulder joints, such as hips, spine, or knee joints. Of 486 subjects, 144 were male and 342 were female (70.4%; Table I).

The study participants were primarily selected if they had never complained of any shoulder pain or discomfort by self-assessment and were interviewed by specially trained interviewers. Physical examinations and shoulder joint ultrasonography were conducted by 2 orthopedic shoulder and elbow surgeon fellows (D.C.S. and T.H.K.). Both shoulders were examined in all participants, unless the participant wanted only 1 shoulder examined.

Our inclusion criteria were as follows:

1. Subjects who did not experience shoulder pain for more than a certain period
2. Subjects who did not have a history of shoulder trauma
3. Subjects who did not have a history of shoulder surgery
4. Subjects who did not have subjective shoulder dysfunction
5. Subjects who did not have shoulder instability
6. Subjects who did not have congenital shoulder abnormalities

Our exclusion criteria were as follows:

1. Subjects who were asymptomatic but who experienced shoulder pain for more than a certain period in the past
2. Subjects who had a history of shoulder trauma
3. Subjects who had inflammatory arthritis, such as rheumatoid arthritis
4. Subjects who had a history of seeking medical care for shoulder disease, such as shoulder instability or arthritis

The interview questions included the participants' sex, age, occupation, dominant hand, smoking history, and presence of diseases, such as diabetes and thyroid disease. The Korean Shoulder Score (KSS)[20] was measured in all participants. Physical examinations consisted of measuring range of motion and assessing strength and endurance. Shoulder range of motion was assessed by forward elevation, external rotation, and internal rotation. Shoulder strength was assessed by shoulder isometry, and endurance was assessed by measuring the amount of time the participant could maintain the glenohumeral joint abducted to 90° in the scapular plane with a 2-kg dumbbell.

Ultrasonography (Purewave system, HD 15; Philips, Bothell, WA, USA) using a 12-MHz linear-array probe was conducted by 2 examiners with an experience of >1000 ultrasonographic shoulder examinations. The ultrasound examinations were performed in the longitudinal and transverse planes of the supraspinatus while the participants were in the Crass or modified Crass position. RCTs were stratified into full-thickness and partial-thickness tears according to the depth and position of the tear (Fig. 1).

Other shoulder joint lesions, such as tendinitis, bursitis, and calcification, were classified as "others." RCTs were classified into 3 groups according to the maximum size of the tear: < 1 cm, ≥1 cm but <3 cm, and ≥3 cm. Readings were accepted only when the findings of the 2 examiners agreed. The statistical analysis was performed by the Department of Statistics of our university. Only full-thickness RCTs were included for the statistical analysis because the accuracy of the ultrasonographic examination for partial-thickness tear was not validated and debatable.[3,9,10,22]

The Fisher exact probability test, the χ^2 test, the Kaplan-Meier survival analysis, and a multivariate analysis of variance were used for the statistical analysis. A stepwise forward logistic regression analysis was conducted to identify the risk factors for RCTs in the general population using age, sex, dominant arm, underlying disease, and smoking as factors.

Table I Age of study participants

Sex	No.	Years, No.				*P*
		≤40	50	60	≥70	
Male	144	53	40	41	10	
Female	342	109	161	64	8	
Total	486	162	201	105	18	.001*

* Statistically significant.

Figure 1 Ultrasonographic findings of rotator cuff show **(a)** a full-thickness tear, **(b)** a partial-thickness tear, and **(c)** a normal cuff tendon.