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Original Article

Prevalence of symptomatic and asymptomatic rotator cuff tears in the general population: From mass-screening in one village

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ARTICLE INFO

Article history:

Received 11 March 2012

Accepted 1 January 2013

Available online 26 February 2013

Keywords:

Rotator cuff tear

Prevalence

Symptomatic

Asymptomatic

ABSTRACT

Purpose: Rotator cuff tear is the most common shoulder disease in patients with shoulder problems, but its prevalence is not well known.

Methods: We performed a health care check-up of locomotive organs in 664 residents (21.3% of the population) in one village. Ultrasonography on bilateral shoulders was performed in all the participants.

Results: One hundred and forty seven out of 664 subjects (22.1%) had full-thickness rotator cuff tears. The prevalence of tear in each decade was 0% in the 20s to 40s, 10.7% in the 50s, 15.2% in the 60s, 26.5% in the 70s, and 36.6% in the 80s. Symptomatic rotator cuff tears accounted for 34.7% of all tears and asymptomatic tears for 65.3%. The prevalence of asymptomatic rotator cuff tears was one-half of all tears in the 50s, whereas it accounted for two-thirds of those over the age of 60. The prevalence of tear was significantly greater in male than in female in the 50s and 60s, but not in the 70s and 80s.

Conclusion: The prevalence of rotator cuff tear in the general population was 22.1%, which increased with age. Asymptomatic tear was twice as common as symptomatic tear.

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1. Introduction

A rotator cuff tear is one of the most common diseases among shoulder disorders in our daily practice. Given the fact that conservative treatment is effective in patients with rotator cuff tears^{1,2} and that the clinical outcome of re-tear patients after

surgery is as good as those with successful repair,³ it is most likely that the very existence of a cuff tear does not always cause shoulder symptoms. In the literature, there have been many reports describing the existence of the asymptomatic rotator cuff tears in large numbers.^{4–6} However, there are few reports demonstrating the prevalence of asymptomatic tears

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in the general population. The purpose of this study was to clarify the prevalence of symptomatic and asymptomatic rotator cuff tears in the general population by conducting mass-screening in one village.

2. Subjects and methods

This survey was taken as a health care check-up of locomotive organs for all the residents in one village, and the educational lectures and exercise guidance for health were also conducted in addition to the check-up. Among the entire population of 3117, 664 individuals (21.3% of the population) came to the check-up: 242 males and 422 females with a mean age of 69.5 years (range, 20–87). All the subjects were informed their data would be published and gave their consent to participate in this study. A questionnaire about their height, weight, dominant hand, occupation, presence or absence of shoulder pain, and past history of shoulder pain had been sent to all of participants before the check-up. Demographics of the participants were shown in Table 1. All subjects had no history of shoulder surgery. In this study, “asymptomatic” was defined as having neither pain nor any other symptoms related to the shoulder when the survey was conducted including the past history of shoulder pain, whereas “symptomatic” was defined as having pain or any other symptoms related to the shoulder when the survey was conducted.

2.1. Ultrasonography

The ultrasonography on bilateral shoulders were performed by a single experienced orthopedic surgeon (HM) with use of a portable ultrasound machine (Sonosite 180, Sonosite, USA) with linear-array probes at 10 MHz. The arm position during the examination was in slight extension and neutral rotation

of the shoulder joint. The supraspinatus and infraspinatus tendons were observed by ultrasound. The long-axis ultrasound scan for the supraspinatus tendon was done at the anterior and posterior levels of the superior facet of the greater tuberosity⁷ and the long-axis scan for the infraspinatus tendon at the middle facet of the greater tuberosity. The defect or concave surface of the rotator cuff tendon was considered to indicate a full-thickness rotator cuff tear. On the basis of our experience, these diagnostic criteria have a sensitivity of 57%, specificity of 100%, positive predictive value of 100%, negative predictive value of 94%, interobserver reliability of 90%, and intraobserver reproducibility of 92% for the diagnoses of full-thickness rotator cuff tears (unpublished data, 2006). Only those with full-thickness tear was included in the tear group: those with partial-thickness tear was not included in the tear group because the sensitivity of ultrasonography for partial-thickness tear was much lower than that for full-thickness tear. The tear size was classified as a small, medium, or large tear according to the Cofield’s classification.⁸

2.2. Statistical analyses

The Spearman correlation coefficient was used to analyze the relationship between the prevalence of rotator cuff tears and the decade of age. The Chi-squared test was used to test the differences of the prevalence of tears between dominant and non-dominant shoulders and between symptomatic and asymptomatic tears. An unpaired t test was used to test the differences in the prevalence of tear between males and females and between forestry workers and unemployed people. All statistical analyses were conducted using the JMP Statistical Package (SAS Institute, Cary, NC) and the critical values for significance were set at $p < 0.05$.

3. Results

One hundred and forty seven out of 664 subjects (22.1%) had full-thickness rotator cuff tears. Of them, symptomatic rotator cuff tears accounted for 34.7% (51 out of 147 subjects) and asymptomatic tears for 65.3% (96 out of 147 subjects). The prevalence of rotator cuff tear in each decade was 0% in the 20s to 40s, 10.7% in the 50s, 15.2% in the 60s, 26.5% in the 70s, and 36.6% in the 80s (Fig. 1). The prevalence of tears significantly increased with age ($r = 0.9636$, $p = 0.0005$). Thirty-eight out of 147 (25.9%) subjects had bilateral rotator cuff tears.

On a gender basis, 61 out of 242 male subjects (25.2%) had rotator cuff tears and 83 out of 422 female subjects (19.7%), there being no significant difference ($p = 0.0956$). The prevalence of rotator cuff tears significantly increased with age both in male ($r = 0.8611$, $p = 0.0466$) and female subjects ($r = 0.9063$, $p = 0.0049$). The prevalence in males was significantly greater than in females in the 50s and 60s ($p < 0.0001$, $p = 0.0099$, respectively), but not in the 70s and 80s (Fig. 2).

Asymptomatic rotator cuff tears accounted for 50% of all tears in the 50s but in those older than 60 years of age, the prevalence of asymptomatic rotator cuff tears was significantly greater than that of symptomatic tears ($p < 0.0001$) (Fig. 3) and twice the prevalence of symptomatic tears. The prevalence of symptomatic and asymptomatic rotator cuff

Table 1 – Demographics of all subjects.

Total number	664
Mean age (years old)	69.5 (range, 20–87)
Mean height	152 cm (range, 128–184)
Mean weight	55 kg (range, 32–101)
Sex	
Male	242 (36%)
Female	422 (64%)
Dominant arm	
Right handed	629 (97%)
Left handed	19 (3%)
Occupation ^a	
Agriculture	198 (30%)
Forestry	50 (8%)
Sewing plant	28 (4%)
Others	207 (31%)
None	177 (27%)
Shoulder pain history	
None	63%
Once or twice	21%
Sometimes	12%
Always	4%

a Include former works.

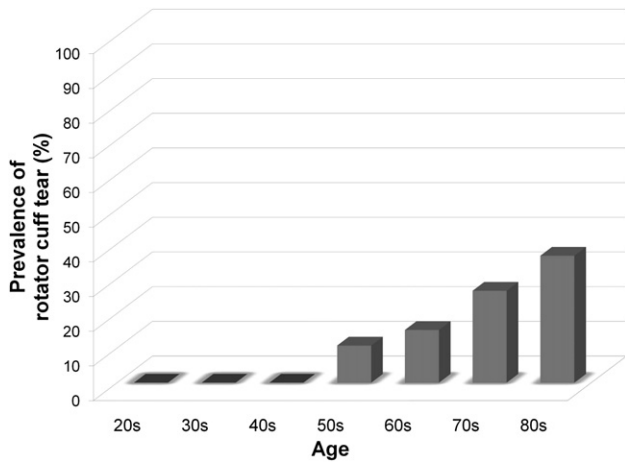


Fig. 1 – Prevalence of rotator cuff tear in each decade. The prevalence of full-thickness rotator cuff tear in each decade was 0% in the 20s to 40s, 10.7% in the 50s, 15.2% in the 60s, 26.5% in the 70s, and 36.6% in the 80s.

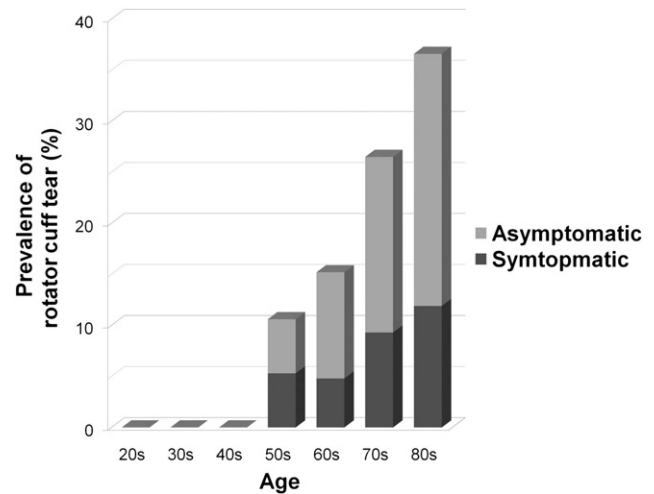


Fig. 3 – Prevalence of symptomatic and asymptomatic tears. Asymptomatic tear accounted for 50% of all tears in the 50s. However, in the 60s and over, the percentage of asymptomatic tear was significantly greater than that of symptomatic tear.

tears significantly increased with age ($r = 0.9063, p = 0.0011$; $r = 0.9426, p = 0.0015$, respectively).

With regard to the tear size, the small-sized rotator cuff tear were most commonly seen (66.3%) in subjects in their 50s, there being no large-sized tear (Fig. 4). However, the prevalence of the large-sized tear increased with age ($r = 0.7250$) and the large-sized tear accounted for a substantial fraction of tears in the 60s, 70s and 80s (43.8%, 45.1%, 43.9%, respectively). The prevalence of the small-sized tear also increased with age ($r = 0.8295$).

The prevalence of rotator cuff tear in the dominant side was 17.8% in the right handed and 17.4% in the left handed,

whereas the prevalence of tear in the non-dominant side was 10.8% and 17.4%, respectively. In the job category (Table 2), the prevalence of rotator cuff tear of forestry workers was 38% which was significantly greater than that of unemployed people (20%) ($p = 0.0051$). There were no significant differences of the prevalence of tear among other jobs.

As for the site of a tear, there was a single tendon tear of the supraspinatus in 184 out of 1338 shoulders (13.8%). Of them, a tear of the anterior half of the supraspinatus tendon was observed in 48 out of 1338 shoulders (3.6%), a tear of the posterior half in 37 shoulders (2.8%), and a tear of the whole

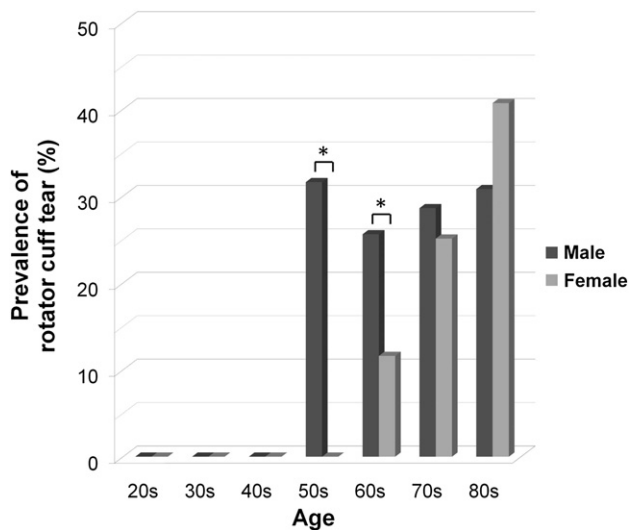


Fig. 2 – Prevalence of rotator cuff tear in male and female subjects. The prevalence in males was significantly greater than in females in their 50s and 60s, but not in the 70s and 80s.

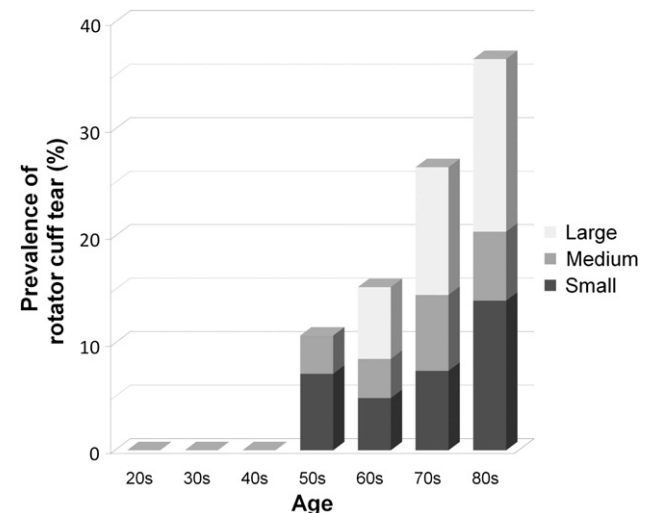


Fig. 4 – Prevalence of tear according to tear size. The small-sized tear was most commonly seen (66.3%) in the 50s. However, the large-sized tear accounted for a substantial fraction of tear in the 60s, 70s and 80s (43.8%, 45.1%, 43.9%, respectively).

Table 2 – Occupation and tear prevalence.

	Number of subjects	Number of tears	Prevalence of tear
Forestry	50	19	38%
Agriculture	198	53	27%
Sewing plant	28	3	11%
Others ^a	207	30	14%
None	177	39	22%

a include housekeeping.

tendon in 99 shoulders (7.4%). A tear involving both the supraspinatus and infraspinatus tendons was observed in 244 out of 1338 shoulders (18.2%), whereas a tear of the infraspinatus tendon alone was observed in 2 shoulders (0.1%).

4. Discussion

Cadaveric studies reported that the prevalence of rotator cuff tears was 3–39%.^{9–14} Studies using MRI or ultrasonography^{5,6} also described that 6–23% of subjects without symptoms had full-thickness tears. From these cadaveric or imaging studies, the prevalence of rotator cuff tear in the general population has been extrapolated. However, the number of subject was limited and the authors investigated only those without symptoms. The true prevalence of rotator cuff tears including both asymptomatic and asymptomatic rotator cuff tears in the general population has not been yet clarified. In the literature, there have been few reports describing the prevalence of tear in the general population. There is only one report by Yamamoto et al¹⁵ who conducted a medical check-up for 683 residents of a mountain village investigating the prevalence of symptomatic and asymptomatic rotator cuff tears and reported that rotator cuff tears were present in 20.7% of the subjects. They described that 36% of the subjects with current shoulder symptoms had rotator cuff tears, while 16.5% of the subjects without symptoms also had rotator cuff tears.

Our data demonstrated that the prevalence of rotator cuff tear in the general population was 22.1%. This was very close to the prevalence of 20.7% in the previous mass-screening reported by Yamamoto et al.¹⁵ The prevalence of tear increased with age: 1/5 in the 50s and 1/3 in the 80s. It is interesting to know that the prevalence of asymptomatic tear also increased with age: 1/2 in the 50s and 2/3 in those older than 60s. Thus, we assume that the younger generation is more likely to have symptoms than the older generation. Our data revealed that the very existence of a cuff tear did not always cause shoulder symptoms, especially in the elderly people.

Although the prevalence of tear was similar between males and females in their 70s or 80s, the prevalence in males was significantly greater in the 50s and 60s. Also, in the job category, the prevalence of tear of forestry workers, a very heavy labor, was greater than that of unemployed people. Thus, overuse of a shoulder joint in male may be one of the causes of rotator cuff tears. However, since this study was a cross-sectional study, a further longitudinal study is needed to clarify the causes and natural history of rotator cuff tear.

The small-sized rotator cuff tear was most commonly seen in the 50s, whereas the large-sized tear accounted for nearly

40% of tear in the 60s or over. This indicates that a cuff tear may appear in a small size in subjects in their 50s and it gradually increases with age. The prevalence of small-sized tear also increased with age, which suggests that a tear may occur at any age and the chances are higher in the elderly people.

This study had several limitations. First, we conducted this survey in a local village, where the population was aging rapidly. The average age of the participants was 70 years. The prevalence of tear may have been different if the survey had been conducted in an urban area. Second, forestry and agriculture are major industries in this village. If the survey had been conducted in other areas with different job proportions, the prevalence would have been different. Third, any suspected cases of partial-thickness rotator cuff tears were excluded from this study. Also, the subscapularis and teres minor tendons were not examined by ultrasound. MRI is more preferable than ultrasonography in terms of examining the location and depth of tear in all four rotator cuff tendons. However, it is almost impossible because of the cost-to-benefit ratio in the mass-screening.

In conclusion, our survey of 664 residents in one village demonstrated that the prevalence of rotator cuff tear was 22.1% in the general population, which increased with age. Asymptomatic tear was twice as common as symptomatic tear.

Conflicts of interest

All authors have none to declare.

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