Prevalence and treatment rate of osteoporosis in people with rotator cuff tear

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INTRODUCTION: Rotator cuff tear is one of the most common diseases in the shoulder and a notable source of shoulder disability. Osteoporosis is also a common skeletal disease and involves a high risk of fracture owing to bone fragility. Osteoporosis has been reported to be a risk factor for the occurrence of rotator cuff tear[1)]. Moreover, lower bone mineral density is an independent risk factor of higher postoperative rotator cuff healing failure[2)]. It has been reported that osteoporosis treatment positively affects people and animal models with rotator cuff tears[3,4)]. Therefore, osteoporosis diagnosis and treatment seem to be important in people with rotator cuff tears. However, the osteoporosis treatment rate in people with rotator cuff tears is still unknown.

The aim of this study was to investigate the prevalence and treatment rate of osteoporosis in people with rotator cuff tears. The rate of appropriate osteoporosis treatment in patients with fragility fractures has been reported to be unacceptably low[5)]. Therefore, we hypothesized that the osteoporosis treatment rate is low, even though the prevalence of osteoporosis in people with rotator cuff tears is high.

METHODS: This cross-sectional study was approved by the Institutional Review Board and Ethics of our institution. The records of healthy volunteers aged 40 or over 40 who attended a health checkup supported by the local government in 2018 were reviewed. Participants received body composition analysis, shoulder ultrasonographic examination to detect rotator cuff tears, and bone status data measured using quantitative ultrasound (QUS). Participants were also asked whether they were being treated for osteoporosis or not. The inclusion criterion was the complete data of the checkup. The exclusion criterion was a history of shoulder surgeries including rotator cuff repair. With reference to a previous report[6)], which reported that a calcaneus ultrasound bone densitometry T score of -1.455 or less was the diagnostic criteria for osteoporosis by the dual-energy X-ray absorptiometry (DXA) method with a specificity of 86.6%, the T score of -1.455 was set as the cutoff value. The subjects were classified into group A, in which no rotator cuff tears were observed, and group B, in which rotator cuff tears were observed by ultrasonographic examination.

Propensity score matching was performed to reduce potential bias. Propensity scores were estimated using a logistic regression model according to the following 4 factors: age, body weight, BMI, and sex. Propensity scores were matched using one-to-one nearest neighbour matching without replacement and calliper width. Statistical examination was performed using unpaired t-test and Fisher's exact test, and the significance level was set at less than 5%.

RESULTS: 245 participants were included in the study. Among the participants, no one had a history of rotator cuff repair or any other shoulder surgeries. Of 245 participants, a total of 61 participants had rotator cuff tear. After propensity score matching, 110 participants were subjected to the analysis. We evaluated 55 participants in group A and 55 participants in group B. Group A and group B had similar demographic characteristics (Table 1).

Regarding the T score examined by QUS, the mean T score of group A was significantly higher than that of group B (-1.1 ± 1.2 vs. -1.7 ± 1.7, respectively; P = 0.041) (Table 2). Moreover, the ratio of the subjects with a T score of -1.455 or less in group A was lower than that in group B (13 of 55 [23.6%] vs 23 of 55 [41.8%], respectively; P = 0.042). There were 5 subjects receiving osteoporosis treatment in group A, and 3 subjects receiving osteoporosis treatment in group B (Table 3). The ratio of subjects with a T score of -1.455 or less and who were receiving treatment for osteoporosis was 4/9 (30.7%) in group A and 3/20 (15.0%) in group B, with no significant difference.

DISCUSSION: This study showed that lower bone mineral density was a risk factor for rotator cuff tears. However, among people with rotator cuff tears and low bone mineral density, the percentage of those who received osteoporosis treatment was 15.0% when calcaneus ultrasound bone densitometry T score of -1.455 was set as the cutoff value for osteoporosis with reference to a previous report[6)]. Considering that the tendon/bone insertion strength of the rotator cuff enthesis was previously shown to decrease due to the decrease in the bone density of the humeral head in osteoporosis model animals[7)], it may also increase the number of rotator cuff tears in humans. This may be one reason why participants with rotator cuff tears had significantly lower bone density in this study. It has been reported that the treatment rate of osteoporosis is about 18.7% even after a hip fracture, and the extremely low treatment rate of osteoporosis is regarded as a problem[8)]. The osteoporosis treatment rate in the present study was also low. Osteoporosis treatment may be desirable as osteoporosis is a risk factor for the development of shoulder rotator cuff tear. In addition, since the prevalence of osteoporosis is significantly higher in patients with rotator cuff tears, it is desirable to check bone mineral density in patients with rotator cuff tears to prevent future fragility fractures. Osteoporosis has been reported to be the sole risk factor for re-tear after rotator cuff repair[2)], and osteoporosis treatment improves rotator cuff tendon-to-bone healing[8)] and reports that it contributes to the reduction of re-tear rate after rotator cuff repair[3)]. Therefore, screening for osteoporosis and appropriate treatment of osteoporosis may be desirable in patients undergoing rotator cuff repair.

This study had some limitations. Bone mineral density was not evaluated by the DXA method but by QUS. In addition, it is still unclear whether osteoporosis treatment contributes to the prevention of rotator cuff tears. Therefore, we plan to verify this through longitudinal studies in the future.

SIGNIFICANCE/CLINICAL RELEVANCE: People with rotator cuff tears had significantly lower bone mineral density than those without. The screening and appropriate treatment for osteoporosis may be desirable in patients with rotator cuff tears as the osteoporosis treatment rate was very low among people with rotator cuff tears and low bone mineral density.

REFERENCES: 1) Hong JP, Huang SW, Lee CH, et al. (2022) J Bone Miner Metab; 40:348. 2) Chung SW, Oh JH, Gong HS, et al. (2011) Am J Sports Med; 39: 2099. 3) Oh JH, Kim DH, Jeong HJ, et al. (2019) Arthroscopy; 35: 1064. 4) Xu J, Ye Z, Chen C, et al. (2022) Am J Sports Med; 50: 1550. 5) Ross BJ, Lee OC, Harris MB, et al. (2021) JBJS Open Access; 6: e20.00142. 6) Steiner B, Dimai HP, Steiner H, et al. (2019) J Ultrasound Med; 38:1553. 7) Chen X, Giambini H, Ben-Abraham E, et al. (2015) PLoS One; 10: e0139384. 8) Hagino H, Sawaguchi T, Endo N, et al. (2012) Calcif Tissue Int; 90: 14. 8) Xu J, Ye Z, Chen C, et al. (2022) Am J Sports Med; 50: 1550.

IMAGES AND TABLES:

Table 1: Demographic data of each group

	Group A (n=55)	Group B (n=55)	P value
Male / Female	25/30	26/29	0.841
Age, year	66.6±9.0	69.0±8.4	0.149
Height, cm	157.7±7.2	157.1±9.2	0.724
Body weight, kg	60.5±10.4	58.6±9.6	0.330
BMI, kg/m^2	24.2±3.2	23.7±2.9	0.377
Body fat percentage, %	28.9±7.8	28.6±7.0	0.795

Table 2: Calcaneus ultrasound bone densitometry

	Group A (n=55)	Group B (n=55)	P value
T score	-1.1 ± 1.2	-1.7 ± 1.7	**0.041**
T score, >-1.455 / ≤-1.455	42 / 13	32 / 23	**0.042**

Table 3: Treatment rate of osteoporosis

	Group A	Group B	P value
Osteoporosis treatment, Yes / No	5 / 50	3 / 52	0.716
T score ≤ -1.455 with osteoporosis treatment / T score ≤ -1.455 without osteoporosis treatment	4 / 9	3 / 20	0.382