ORIGINAL ARTICLE

A Relationship between Calcium Deposit Size with the Pain Intensity on The Patients with Calcified Tendinitis in The Rotator Cuff

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ABSTRACT

Background: Calcified tendeinitis is a disease characterized by calcification of multifocal cells mediated by living tissue. Calcified tendeinitis may occur due to the collection of calcium in the pouch of supraspinatus tendon or may spread between rotator cuff muscle fibers and bursa. This deposit may or may not cause pain of discomfort. The study aim is to determine the correlation of calcium deposit size to the pain intensity in patients with calcified tendinotis.

Methods: A cross-sectional study, on subjects, were diagnosed with calcified tendinitis rotator cuff by musculoskeletal ultrasonography examination.

Results: The twenty subjects, aged 50-70 years old, No significant correlations were found between calcium deposit size with the pain intensity using VAS, r=0.238, p=0.32.

Conclusion. The size of the calcium deposit has not correlated with the pain intensity in rotator cuff calcified tendinitis patients. But further research is needed whether the location and form of calcium deposits affect the pain intensity in calcified tendinitis rotator cuff patients.

Keywords: *calcified tendinitis; calcium deposit size; pain intensity.*

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INTRODUCTION

Calcified tendinitis is a disease characterized by calcification of multifocal cells mediated by living tissue.[1] The incidence of rotator cuff calcification without shoulder symptoms in the general population

is 3-20% according to different reports. The highest frequency is in adults aged 30-50 years.[2] The impact of symptomatic calcifying tendinitis appears to have declined in the last 20-30 years. The supraspinatus tendon was affected most often. The Calcification observed with decreasing frequency in the infraspinatus, the teres minor, and the subscapularis tendons. More than one of the tendon may be involved. Women (homemakers and clerical workers account for most cases) were affected slightly more frequently than men, and the right shoulder was affected somewhat more often than the left. Both shoulders can have or develop calcific deposits in 13-47% of the subjects. The calcific deposit usually was described approximately 1-2 cm proximal to the tendon insertion on the greater tuberosity.

Calcified tendinitis may occur due to the accumulation of calcium in the supraspinatus tendon pouch or may spread between rotator cuff muscle fibers and or the bursa. The Calcific tendinitis may found on subjects more than 40 years old, usually during the fifth and sixth decades of life. It occurs within the supraspinatus tendon in almost 50% of the cases. The incidence was more common in females (60%), sedentary workers, and 45% were the housewives.[2]

During the acute resorptive phase, the calcium deposits show increase vascularization with macrophage and mononuclear giant cell infiltration together with fibroblast formation, produces an aggressive inflammatory cell accumulation. There are excessive edema and rise of the intra-tendinous pressure, leads to severe pain which is attributed by some to secondary impingement resulting from the increased tendon size, or due to rupture of the deposits into the subacromial space or bursa.[2]

Calcified tendinitis characterized with pain in the anterolateral arm, which does not exceed the elbow. There is a pain especially at night and weakness during movement of the shoulder.[2,3] Most patients complain of chronic pain and few with acute or sub-acute pain on overuse and stretching shoulders.[4] The shoulder pain may limit daily activity, increase dependency, and finally may reduce the quality of life. Early diagnosis is necessary to prevent the further decline of shoulder function. There is still a limitation of evidence in Indonesia, how to diagnose by analyze shoulder pain by physical examination and consider the size of calcification on rotator cuff by ultrasound finding. Measurement of pain is using Visual Analog Scale (VAS), which subjectively measures pain intensity by patients' scale of perceived.[5] The aim of this study to finding the correlation between the size of calcium deposit with the pain intensity on the individual with calcified tendinitis of the rotator cuff.

METHODS

This study was a cross-sectional study, conducted in the outpatient clinic of Medical Rehabilitation Department of Cipto Mangunkusumo Hospital, Jakarta, Indonesia. Twenty subjects, aged 50-70 years old, diagnosed with calcified tendinitis rotator cuff through musculoskeletal ultrasonography examination. Inclusion criteria include pain with VAS $\geq$ 4, willing to participate in this study and sign the informed

consent. Subjects excluded if diagnosed with infection and malignancy that caused shoulder pain, shoulder rheumatoid or osteoarthritis, partial or total tear of rotator cuff and not cooperative.

Calcium deposit size measured with musculoskeletal ultrasonography examination (in mm). The pain intensity assessed with a visual analog scale (VAS) by 0 to 10 range. The number of 0 means no pain, 1-3 means the mild pain intensity, 4-6 means moderate pain intensity and 7-10 indicates severe pain intensity.

All of the data were presented in the tables, followed by the statistical analysis was used the Statistical Product and Service Solution (SPSS) v.18 for windows. The Kolmogorov-Smirnov test was used to evaluate the normality of data distribution. The Spearman and Pearson correlation coefficients were applied to assess the relationship between variables.

RESULTS

Characteristic of subjects

The study population consisted of 55% (n=11) females and 45% (n=9) males calcified tendinitis rotator cuff patients. Their median age was 62.00 (55-70) years old. Right shoulder (65%; n=13) more than left shoulder (35%; n=7). Calcium deposit dominantly found at supraspinatus (65%; n=13), followed by subscapularis (25%; n=5), then infraspinatus (10%; n=2). Single calcification dominant than multiple calcifications (65%:35%). The onset of the pain was 4.50 (3-6) month.

The Mean calcification size was 4.93 (±1,86) mm. The Mean of pain intensity (VAS) was 57.00 (±10.25) mm. This clinical characteristic of subjects can see in table 1.

Table 1. Clinical characteristic of subjects

Characteristic	Statistical analysis
Age(year)	62.00 (55-70)
Gender	
Female	55% (n=11)
Male	45% (n=9)
Shoulder	
Right	65% (n=13)
Left	35% (n=7)
Location	
Supraspinatus	65% (n=13)
Infraspinatus	10% (n=2)
Subscapularis	25% (n=5)

Calcification	
Single	65% (n=13)
Multiple	35% (n=7)
Onset (Month)	4,50 (3-6)
Calcification size	4,93 (±1.86)
VAS score	57.00 (±10.25)

Table 2. Correlation between calcium deposit size and pain intensity

Variable	r	P Value
Calcium deposit size Pain intensity (VAS)	-0.238	0.312

There were no correlations between the calcium deposit size and the pain intensity.

DISCUSSION

The prevalence of tendinitis calcified rotator cuff was 2-20% in asymptomatic (no pain) rotator cuff disorder, whereas, in patients with rotator cuff pain, the prevalence was reported to be 50%. Most often in the age of 30-60 years.[1] There was no correlation of the incidence of the disease with heavy work or exercise with shoulder joint movement overhead in the dominant upper extremity.[1,2] The calcified tendinitis occurs most often in the supraspinatus tendon (80%), followed by the infraspinatus tendon (15%) and the tendon of subscapularis (5%).[3] The clinical characteristics of this study were no different from previous studies, except for age. In this study, the age range was 55-70 years old, the age range was older compared to the earlier of rotator cuff tendinitis studies such as at 48.4 years by Perlick et al.[6] and 46.6 years by Albert et al.,[7] however similar with the research by Hsu et al.[8] and Pan et al.[4] which had the age range at 54.4 years and 55.2 years consecutively.

The etiology of calcified tendinitis is still controversial. Hypoxia of the local tissue and local stresses cited as contributing factors. Two different fundamental processes that lead to the formation of calcium deposits in the rotator cuff that has erupted are degenerative calcification, and reactive calcification.[7] Degeneration of rotator cuff tendon fibers usually associated with a wear-and-tear effect and aging. The glenohumeral joint is the most commonly used universal joint in the body, and studies conducted in Sweden show that pressure and stress caused by work involving the arm may cause supraspinatus tendinitis. However, there is no evidence that a worker engaged in heavy work involving the shoulder will cause calcified tendinitis over time, and Olsson suggests that the rotator cuff tendon of the dominant arm does not degenerate more than its contralateral arm.[1]

Aging is considered the prior cause of degeneration in the rotator cuff tendon. According to Brewer that with aging there is a decrease in supraspinatus tendon vascularization along with changes in muscle fibers.[1] The most noticeable difference relating to age has seen in fascicles, the collagen bundle which is the typical architecture of the tendon. Start in the late 40s to 60s, most fascicles begin to deplete and fibrillation, which defined as a degenerative process. The thinning fascicles show irregular cellular arrangement, and the fibers are fragmented. The volume of connective tissue carrying blood vessels between the fascicles may increase compared with the size of the bundles.[1] In general supporters of the degenerative calcification theory fail to consider the age distribution, disease causes and morphological aspects of calcified tendinitis. The incidence of calcification increased with age in the case of degenerative calcification, whereas the prevalence of calcine tendinitis peaked at the age of 50s. Also, the degenerative process never shows the potential for self-healing. As well as histologically the features of degenerative calcification and calcification tendinitis are quite different.[1]

Pre calcification Phase

At this stage where calcification predilection undergoes fibro cartilage changes, metaplasia of muscle cells (tenocytes) to chondrocytes is accompanied by metachromatic, in collaboration with proteoglycans.

Calcification Phase

The calcification stage divided into developmental phase, rest phase, and resorptive phase. During the formative period, the calcium crystals are stored mainly in the matrix vesicles, which combine to form a significant focus of calcification. If the patient undergoes surgery during this stage, the deposit will look like a chalk picture and should be gouged out. In the resting phase, fibro collagen tissue borders the focus of calcification. The presence of this tissue shows the deposition of calcium in place terminated. During the resorptive phase, after an inactive period that varies from the disease process, resorptive calcium occurs by thin-walled blood vessels on the periphery of the deposit. Soon after, the deposit surrounded by macrophages and nuclear giant cells that phagocytosis and eliminate calcium. If surgery performed at this stage, the calcification looks soft and thick like toothpaste .[1]

Post calcification Phase

Along with calcium resorptive, the granulation tissue contains young fibroblasts, and new blood vessels begin to overhaul the space previously occupied by calcium deposits.[7] Although the pathogenesis of the calcification process can reasonably have established by looking at its morphology, it can not determine what triggers the occurrence of fibrocartilage changes early in the process. Codman proposed tissue hypoxia as etiology because of the uniqueness of the supraspinatus tendon blood supply and shoulder mechanism. Nor do the factors that trigger the resorptive process are still unknown.[1]

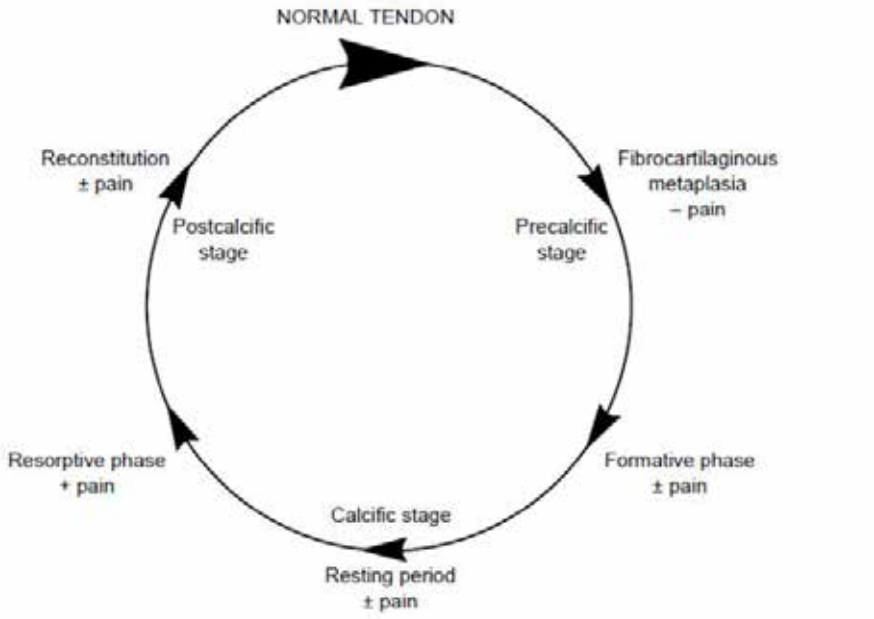

Figure 1. Calcified stage scheme of calcified tendinitis.[1]

Uthoff et al. agree that the calcification process is actively mediated by cells in a proper environment and that the formation of calcium deposits should precede resorptive. Therefore, Uthoff et al. proposes that the evolution of the disease can be divided into three distinct phases, namely precalification, calcification, and postcalcification (Fig. 1).[1]

No significant correlations have found between calcium deposit size and pain intensity using VAS. The means that the size of calcium deposit did not cause the pain. The pain that arises is moderate pain and must manage.[10] However, other things such as a location of calcium deposits may consider, whether the calcium deposit located in the bursa is more painful than the calcium deposits located in the tendon fibers or vice versa. In Perlick's study, it has found that pain increased when the calcium deposit penetrated into the subacromial bursa.[11] It may also consider the form of calcium deposit, whether a calcium deposit that is scattered structure like chalk (developmental phase) is more painful than a calcium deposit that is firmly boundary and thick as having a resting period or vice versa.[11] The indeed requires further research.

CONCLUSION

The size of the calcium deposit has not correlated with the pain intensity in rotator cuff calcified tendinitis patients. Regardless of calcium deposit will cause pain; thus the pain intensity was moderate, so pain management must handle adequately. However, the further research is needed whether the location and form of calcium deposits affect the pain intensity in calcified tendinitis rotator cuff patients.

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