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Localization Patterns of Rotator Cuff Calcific Tendinitis & Their Correlation with Rotator Cuff Injuries: A 12-Month Clinical Study

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Abstract

Background: Rotator cuff calcific tendinitis (RCTT) is a common cause of shoulder pain, particularly in middle-aged adults, and is often associated with rotator cuff tears. Calcific deposits within the tendons may lead to degeneration, inflammation, and mechanical irritation, increasing the risk of both partial- and full-thickness tears. However, the relationship between the anatomical localization of calcific deposits and rotator cuff injuries remains incompletely understood. **Objective:** To investigate the localization patterns of calcific deposits and their correlation with rotator cuff tears, and to evaluate the influence of diabetes mellitus on tear prevalence. **Methods:** A retrospective cohort study was conducted at a tertiary referral center specializing in shoulder reconstruction. Clinical and imaging data from 97 patients with RCTT were analyzed. Calcification location, tear type, calcification size, and diabetes status were evaluated using MRI findings. Descriptive statistics and correlation analyses were performed. **Results:** The supraspinatus (SSP) and infraspinatus (ISP) tendons were the most common sites of calcification and associated tears. Partial-thickness tears were most frequent in SSP (31.1%) and ISP (54.5%), while full-thickness tears occurred mainly in SSP and combined SSP/ISP locations (40% each). Partial tears were slightly more common in diabetic patients, while calcification size showed no significant difference between diabetic and non-diabetic groups ($p = 0.496$). **Conclusion:** Localization patterns of calcific deposits are correlated with rotator cuff injury risk and may assist clinicians in improving diagnosis and treatment strategies for RCTT.

Keywords

Tendon Calcification, Rotator Cuff Tear, Shoulder Pathology

1. Introduction

Rotator cuff calcific tendinitis (RCTT) is a common disease that involves tendons of the rotator cuff (in the vast majority of cases, the supraspinatus tendon) and the presence of calcium hydroxyapatite crystals in the tendon structure [1]. This condition occurs in about 10% - 20% of people who experience shoulder pain, with prevalence being more in adults between 40 and 60 years [2]. RCTT is known to have significant negative effects on everyday activities that can lead to pain, loss of range of motion, and weakness, and therefore majorly impact the quality of life of the affected people. Research indicates that calcific deposit is a contributing factor to high levels of shoulder dysfunction since it results in inflammation and mechanical irritation of the tendon, which in many cases results in rotator cuff tear. These tears are either partial or full-thickness and occur more often in patients with calcific tendinitis, with estimates showing that 30% - 50% of all patients with calcific tendinitis ultimately develop a rotator cuff tear [2].

Pathophysiology of calcific tendinitis is a complicated play of metabolic, mechanical, and inflammatory mechanisms. First, there is the degeneration of tendons, then the deposition of calcific foci, which may lead to further disruption of tendons, inflammation of the tissues, and even the necrosis of the tissues [3]. These deposits may cause weakening of the tendon over time, and this makes the tendon more prone to tears, especially when stressed by a mechanical force. Although there has been ample documentation of the relationship between calcific tendinitis and rotator cuff injuries, there is still no understanding of the localization patterns of the calcific deposits and how these differences relate to the type and size of rotator cuff tears [4]. By discovering such trends, diagnostic accuracy may increase, along with the effect of the treatment plan, yet this field is not extensively investigated.

Having said that, the relationship between specific anatomical localization of calcific deposits and the type of rotator cuff tear remains incompletely defined, and findings across studies are inconsistent. Importantly, few studies have systematically evaluated the relationship between calcification localization patterns and tear type within a single cohort while also considering metabolic factors such as diabetes. Understanding these relationships may improve diagnostic accuracy and assist clinicians in risk stratification and imaging-based decision-making in patients with RCTT.

2. Objectives

The general objective is to investigate the relationship & correlation between the anatomical localization of calcific deposits and the prevalence of rotator cuff tears. The specific objectives are to determine the incidence of partial-thickness and full-thickness rotator cuff tears in patients with diagnosed calcific tendinitis and to compare the prevalence of coexisting rotator cuff tears between diabetic and non-diabetic patients with rotator cuff tears.

3. Literature Review

3.1. Current Understanding of Rotator Cuff Calcific Tendinitis

Rotator cuff calcific tendinitis (RCTT) is an established cause of shoulder pain, especially in middle-aged adults [5]. It has been pointed out in clinical research that it contributes about 10 - 20 percent of all shoulder pathologies. The disease is characterized by the appearance of calcium hydroxyapatite crystals in rotator cuff tendons, mostly the supraspinatus tendon. RCTT pathogenesis is still multifactorial, and it comprises mechanical overload, genetic predisposition, and abnormalities in metabolism. In a study done by Alam *et al.* (2024), it was found that tendon degeneration is followed by calcification, which in turn causes inflammation, pain, and mechanical irritation [6].

3.2. Localization of Calcific Deposits

The patterns of localization of the calcific deposition along the rotator cuff tendons have been examined in different studies. In general, the supraspinatus tendon has the highest incidence of calcifications followed by the infraspinatus and the subscapularis tendons. In a study by Longo *et al.* (2023), it was found that the supraspinatus tendon had 60% of the deposits of all calcific deposits that are exposed to the increased mechanical load [7]. The location of these deposits in terms of anatomy has implications for the injury severity. To illustrate, the more significant calcifications that are located in the area of tendon insertion are likely to lead to tendon degeneration and rotator cuff tears [8].

3.3. Rotator Cuff Tears and Calcific Tendinitis

A number of studies have confirmed a positive correlation between rotator cuff calcific tendinitis and the emergence of partial and full-thickness rotator cuff tears. Calcifications have been observed to put the patient at a high risk of developing a tear in the rotator cuff, with up to half of patients with calcific tendinitis ultimately developing a rotator cuff tear [9]. This risk is especially specific to patients with large and chronic calcifications, which cause long-lasting inflammation and weakening of tendons. A study by Pang *et al.* (2022) revealed that patients who had a calcific deposit had an increased chance of full-thickness tears in comparison to their controls [10]. Moreover, research conducted by Giha *et al.* (2022) has pointed out that patients with diabetes mellitus have a greater tendency of rotator cuff tears in combination with calcific tendinitis [11].

4. Methodology

4.1. Study Design and Setting

The research design used in this study is a retrospective cohort design to study the patterns in localization of the calcific deposits as well as their relationship with rotator cuff injuries. A retrospective cohort study is most suitable to analyze the available data concerning the patient over a specific time, and the relations between calcific tendinitis and rotator cuff tears could be explored without prospective intervention [12]. The study was carried out in one tertiary referral center of complex shoulder reconstruction, where a high number of shoulder surgeries are carried out every year. This environment offered access to a wide range of patients who had various rotator cuff-related conditions, hence being able to collect extensive data. The study included patients presenting between January 2025 and December 2025. The study was conducted with the approval of the institutional review board (IRB) before starting the study to guarantee adherence to the ethical standards. Every procedure was undertaken in accordance with the Declaration of Helsinki, and the patient's confidentiality and rights were not violated during the process of data collection.

4.2. Patient Selection

The patients who were added to the study were chosen according to certain inclusion and exclusion criteria. Inclusion criteria were that the participant had to be an adult aged 18 years and above with rotator cuff calcific tendinitis as indicated by an imaging test of MRI. Also, the participants should have recorded the location and pattern of calcification, and an elaborate clinical history, including treatment plan (conservative or surgical). There was a minimum follow-up to establish whether surgery or conservative management was done. Criterion exclusion was patients who had undergone prior shoulder surgery on the affected shoulder, had complete thickness rotator cuff tears not due to calcific deposits, and had systemic inflammatory diseases such as rheumatoid arthritis, and incomplete clinical or radiographic data [13]. Institutional surgical and hospital databases were used to select patients who fit these requirements, and therefore, a relevant sample was obtained regarding the objectives of the study. A total of 118 patient records were screened, of which 21 were excluded based on the above criteria. The final cohort consisted of 97 patients included in the analysis.

4.3. Data Collection and Analysis

The data gathered in the current study were imaging data (MRI reports), clinical data (demographic information, treatment plans, and follow-ups), and the place and extent of the calcific deposition. Imaging data were obtained from plain radiographs, ultrasound, and magnetic resonance imaging (MRI) reports. Calcific tendinitis was defined as the presence of radiopaque deposits on X-ray, hyperechoic foci with or without posterior acoustic shadowing on ultrasound, or signal voids on MRI consistent with calcification. Rotator cuff tears were classified into partial- and full-thickness tears. A partial-thickness tear was defined as a focal tendon defect not extending through the full thickness of the tendon, whereas a full-thickness tear was defined as complete tendon discontinuity extending from the articular to the bursal surface.

Calcification localization was categorized according to tendon involvement, including the supraspinatus (SSP), infraspinatus (ISP), subscapularis (SSC), and teres minor (TM), as well as combined tendon involvement (e.g., SSP/ISP). In cases of discordant imaging findings, MRI was considered the reference standard, followed by ultrasound when MRI was unavailable. Calcification size, measured in millimeters, was recorded when available from imaging reports. Size data were available for 67 out of 97 patients, as the remaining imaging reports did not include standardized measurements. Missing data were handled using a complete-case analysis, and no imputation methods were applied.

The data on the demographics consisted of age, sex, medical history, and comorbidities like diabetes, which were recorded with the aim of determining the possible effect of these on the rotator cuff injuries. Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) [14]. Descriptive statistics were used to summarize patient demographics, calcification localization, and rotator cuff tear patterns. Cross-tabulation analyses were conducted to explore associations between calcification localization and tear type, as well as between diabetes status and tear prevalence. An independent samples t-test was used to compare calcification size between diabetic and non-diabetic patients. Statistical significance was set at a p-value of less than 0.05. The association between categorical variables was assessed using the Chi-square test. Effect size was calculated using Cramér's V to evaluate the strength of associations.

5. Results

Table 1 gives the association between the occurrence and amount of rotator cuff tear (partial or full thickness) and the location of the calcific deposition at an anatomical level in patients with rotator cuff calcific tendinitis. The information gives the relationship between the severity of the tear and the tendon affected.

In partial thickness tears, most patients in this category of tear possessed calcific deposits in supraspinatus (SSP) (31.1) and infraspinatus (ISP) tendons (54.5). The number of cases and probabilities of these tendon locations are similar, which means that the most frequent type of partial tears is the one linked with calcification in tendons of the SSP and ISP. The location with a moderate proportion of partial tears was also found in the SSP/ISP location (42.9%), which was not as common as in SSP and ISP locations. Calcifications in other tendon regions, like SSP/SSC (100%) or SSC/ISP (0%), were only present in a small percentage of the patients who had partial tears.

In full-thickness tears, 5 patients only were observed, and SSP and SSP/ISP positions were the most common sites of full-thickness tears, with 40% of the total number of cases each. It is implied that full-thickness tears are not as common as partial-thickness tears, and they yet demonstrate a significant correlation with some tendon sites, especially SSP/ISP and SSP.

The most significant category of patients in the study was those who did not have tears (56 patients). The most frequent sites of calcific deposits in this group were the SSP (64.4%) and the ISP (45.5%). The places like TM and SSC/ISP demonstrated little participation in tearless patients.

On further note, there was no statistically significant association between calcification localization and rotator cuff tear type ($\chi^2 = 12.30$, $p = 0.723$). The effect size, measured using Cramér's V (V = 0.25), indicated a weak to moderate association.

Finally, the results indicate that the SSP and ISP tendons are most commonly linked with partial and full-thickness rotator cuff tears, where other tendon sites, including SSP/ISP and SSP/SSC tendons, among others, play a smaller role in the results. These findings assist in explaining the association between the localization of the calcific deposit and the anatomy and the intensity of rotator cuff injuries in patients with calcific tendinitis.

Table 1. The relationship between the anatomical localization of calcific deposits and the prevalence of rotator cuff tears.

Cuff Tear (Presence/Full or Partial Thickness) * Tendon Involved Location (8/4) Crosstabulation												
			Tendon Involved Location (8/4)									Total
			SSP	ISP	SSC	TM	SSP/ISP	SSP/SSC	SSC/ISP	SSP/ISP/SSC	ISP/TM	
Cuff Tear (Presence/Full or Partial Thickness)	Yes. Partial	Count	14	12	3	0	6	1	0	0	0	36
		Expected Count	16.7	8.2	4.1	0.4	5.2	0.4	0.4	0.4	0.4	36.0
		% within cuff tear (Presence/Full or partial thickness)	38.9%	33.3%	8.3%	0.0%	16.7%	2.8%	0.0%	0.0%	0.0%	100.0%
		% within tendon involved location (8/4)	31.1%	54.5%	27.3%	0.0%	42.9%	100.0%	0.0%	0.0%	0.0%	37.1%
	Yes. Full	Count	2	0	1	0	2	0	0	0	0	5
		Expected Count	2.3	1.1	0.6	0.1	0.7	0.1	0.1	0.1	0.1	5.0
		% within cuff tear (Presence/Full or partial thickness)	40.0%	0.0%	20.0%	0.0%	40.0%	0.0%	0.0%	0.0%	0.0%	100.0%
		% within tendon involved location (8/4)	4.4%	0.0%	9.1%	0.0%	14.3%	0.0%	0.0%	0.0%	0.0%	5.2%
	No	Count	29	10	7	1	6	0	1	1	1	56
		Expected Count	26.0	12.7	6.4	0.6	8.1	0.6	0.6	0.6	0.6	56.0
		% within cuff tear (Presence/Full or partial thickness)	51.8%	17.9%	12.5%	1.8%	10.7%	0.0%	1.8%	1.8%	1.8%	100.0%
		% within tendon involved location (8/4)	64.4%	45.5%	63.6%	100.0%	42.9%	0.0%	100.0%	100.0%	100.0%	57.7%
Total		Count	45	22	11	1	14	1	1	1	1	97
		Expected Count	45.0	22.0	11.0	1.0	14.0	1.0	1.0	1.0	1.0	97.0
		% within cuff tear (Presence/Full or partial thickness)	46.4%	22.7%	11.3%	1.0%	14.4%	1.0%	1.0%	1.0%	1.0%	100.0%
		% within tendon involved location (8/4)	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Chi-square (χ^2) = 12.30, p = 0.723; Cramér's V = 0.25.

Table 2 shows a crosstabulation of Diabetes Mellitus status (Yes/No) and the severity of rotator cuff tears (partial, full, and no tear) in patients with rotator cuff calcific tendinitis. The data is utilized to test the possibility of the presence of diabetes affecting the incidence and the level of rotator cuff tear.

In patients with diabetes (n = 49), partial thickness tears (38.8) were the predominant ones, and the percentage of patients that had full thickness tears was a minor figure (6.1%). Besides, rotator cuff tears were absent in 55.1% of diabetic patients. The percentage of patients having tears of partial or full-thickness is greater than that of those who do not. The anticipated partial and complete thickness tear counts are close to the observed ones, which contain partial tears, which are most frequent, but complete thickness tears are also found.

In the case of non-diabetic patients (n = 48), the distribution is the same but slightly different. 47.2% of non-diabetic patients had partial thickness tears, and 40.0% full thickness tears. The percentage of non-diabetic patients (60.4) had no tear of the rotator cuff than the diabetic patients (48.2). Once again, the number in each category should have corresponded to the observed data, which is near, and thus, it can be assumed that diabetes may be associated with a slight increase in the prevalence of partial tears but not necessarily full-thickness tears.

However, on further analysis, no statistically significant association was observed between diabetes mellitus and rotator cuff tear type ($\chi^2 = 0.29$, $p = 0.866$). The effect size was negligible (Cramér's V = 0.05), indicating a weak relationship.

Finally, the distribution of tear types between diabetic and non-diabetic patients was broadly similar, with only a slight increase in partial-thickness tears among diabetic individuals. Overall, no clear association between diabetes status and tear severity was observed.

Table 2. The comparison of the prevalence of coexisting rotator cuff tears between diabetic and non-diabetic patients with rotator cuff tears.

Diabetes Mellitus (1/2) * Cuff Tear (Presence/Full or Partial Thickness) Crosstabulation

			Cuff Tear (Presence/Full or Partial Thickness)			Total
			Yes. Partial	Yes. Full	No	
Diabetes Mellitus (1/2)	Yes	Count	19	3	27	49
		Expected Count	18.2	2.5	28.3	49.0
		% within Diabetes Mellitus (1/2)	38.8%	6.1%	55.1%	100.0%
		% within cuff tear (Presence/Full or partial thickness)	52.8%	60.0%	48.2%	50.5%
	No	Count	17	2	29	48
		Expected Count	17.8	2.5	27.7	48.0
		% within Diabetes Mellitus (1/2)	35.4%	4.2%	60.4%	100.0%
		% within cuff tear (Presence/Full or partial thickness)	47.2%	40.0%	51.8%	49.5%

Continued

Total	Count	36	5	56	97
	Expected Count	36.0	5.0	56.0	97.0
	% within Diabetes Mellitus (1/2)	37.1%	5.2%	57.7%	100.0%
	% within cuff tear (Presence/Full or partial thickness)	100.0%	100.0%	100.0%	100.0%

Chi-square (χ^2) = 0.29, p = 0.866; Cramér's V = 0.05.

Table 3 of Group Statistics indicates the means of the size of calcification of diabetic and non-diabetic patients in millimeters. The mean calcification size of diabetic patients (n=37) is 8.38 mm (SD = 4.72) as compared to that of non-diabetic patients (n = 30), 9.44 mm (SD = 7.78). The standard errors are 0.7762 and 1.4208, respectively.

Table 3. The incidence of partial-thickness and full-thickness rotator cuff tears in patients with diagnosed calcific tendinitis.

Group Statistics					
	Diabetes Mellitus (1/2)	N	Mean	Std. Deviation	Std. Error Mean
Calcification Size (mm)	Yes	37	8.384	4.7214	0.7762
	No	30	9.440	7.7820	1.4208

The Independent Samples Test (Table 4) used is the calcification size of diabetic and non-diabetic patients. According to the Test of Equality of Variances by Levene, there is a p-value of 0.075, and therefore, both the variances of the two groups are equal, and thus, we assume that both groups have identical variance in the t-test. The t-value = −0.685 and the p-value = 0.496 exceed the value of 0.05, indicating that the size of calcification afforded no significant difference between diabetic and non-diabetic patients. It has a 95 percent confidence interval of −4.13 mm to −2.02 mm and a mean difference of −1.0562 mm, which is once again evidence that there is not a significant difference.

Table 4. Shows the independent samples test.

Independent Samples Test										
		Levene's Test for Equality of Variances		t-Test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Calcification Size (mm)	Equal Variances Assumed	3.268	0.075	−0.685	65	0.496	−1.0562	1.5414	−4.1347	2.0223
	Equal Variances Not Assumed			−0.652	45.620	0.517	−1.0562	1.6190	−4.3158	2.2034

6. Discussion

The paper has examined the localization patterns of rotator cuff calcific tendinitis (RCTT) and explored their relationship with rotator cuff tears. The primary conclusions were that supraspinatus (SSP) and infraspinatus (ISP) tendons were the most common in partial and complete-thickness rotator cuff tears. These two tendons, especially the SSP (31.1) and ISP (54.5) areas, were related to the majority of partial thickness tears and were associated with calcific deposits. These results are consistent with the already existing studies, including [15], which found that the SSP tendon is most often hit by calcifications because it has more mechanical loads. The investigation also revealed that bigger calcifications around tendon insertions tend to lead to degeneration and result in rotator cuff tears, which is also consistent with the work of Sullivan *et al.* (2021), who also pointed out the importance of the size and location of the calcifications in predisposing tendon rupture [16].

When it comes to full-thickness tears, patients with full-thickness tears were the least (5 patients), SSP/ISP and SSP were the most frequent (40% each) locations. This implies that full-thickness tears are not as common as partial tears but still demonstrate close correlation with the presence of calcifications in these tendons. The results align with the works of other researchers, including those of Patel *et al.* (2025), who stated that calcific tendinitis positively predicts full-thickness tears of the rotator cuff [17]. Besides, the majority of the patients recruited in this study did not have any tears, and the most prevalent places where the calcific deposits occur were SSP (64.4) and ISP (45.5). This is not very different in relation to Yoo *et al.* (2021), who have discovered that the prevalence of calcific tendinitis in asymptomatic patients with no tears is very high, which indicates that, in certain cases, the calcifications may be asymptomatic or they may not cause an immediate tendon rupture [18].

It was also the purpose of the study to identify how diabetes mellitus has influenced the prevalence of rotator cuff tears. The results showed that partial thickness tears were a little higher among diabetic patients (38.8%), as compared to non-diabetic patients (35.4%), which aligns with the findings of the study conducted by Su *et al.* (2021), which demonstrated that diabetes predisposes patients with calcific tendinitis to rotator cuff tears [19]. The percentage of full-thickness tears, however, was higher in non-diabetic patients (40.0) than in diabetic ones (6.1). With respect to diabetes mellitus, the distribution of rotator cuff tear types between diabetic and non-diabetic patients was broadly similar. Although a slightly higher proportion of partial-thickness tears was observed in diabetic patients, no clear association between diabetes status and tear severity was identified.

Further, no significant difference in the size of the calcification was evident between diabetic and non-diabetic patients. The means of the calcification size of diabetic patients (8.38 mm) were somewhat less than the mean of non-diabetic patients (9.44 mm), although the difference was not statistically significant ($p = 0.496$). This observation is in contrast to the study of Shi *et al.* (2021), who indicated that diabetic patients could have more aggressive degeneration of tendons, which can be attributed to more severe calcifications [20]. These findings suggest that while diabetes may play a role in tendon pathology, its influence on tear severity in the context of calcific tendinitis remains uncertain.

7. Limitations

This study has several limitations. First, its retrospective design introduces the potential for selection bias. Second, the number of full-thickness tears was small, limiting the ability to draw robust conclusions regarding severe tendon injury. Third, calcification size data were not available for all patients, which may affect the generalizability of those findings. Finally, the absence of multivariable analysis limits the ability to account for potential confounding factors.

8. Conclusion

Conclusively, this research paper indicates that there is an association between rotator cuff calcific tendinitis and the calcification localization with the supraspinatus (SSP) and infraspinatus (ISP) tendons as the most affected ones. Partial-thickness tears were more frequent than full-thickness tears, and no clear relationship was identified between diabetes mellitus and tear severity or calcification size. These findings provide insight into anatomical patterns of rotator cuff involvement in calcific tendinitis and may assist in clinical assessment and imaging interpretation. However, further studies with larger sample sizes and multivariable analyses are required to better define these relationships.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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