A STUDY TO EVALUATE THE OCCURRENCE OF TROCHLEAR CALCIFICATION

Aamir Javed Khan ∗, Yassar Shiekh ∗∗ and Mahrukh Khan ∗∗∗,1

∗ Acharaya Shri Chander College of Medical Sciences, Jammu, ∗∗ Govt Medical College, Doda, ∗∗∗ ELMCH, Lucknow.

ABSTRACT Background: To study the prevalence of trochlear calcification in orbit. Material and methods: Computed tomography scan reports of 220 patients was collected retrospectively for the presence of trochlear calcification. Data were categorised according to their age, sex and specific personal history and history of systemic illness or ocular disease. Result: Out of 220 scans collected, only 37 (16%) patients showed trochlear calcification. The males showed more predominance in comparison to the females. The maximum number had a history of ocular trauma while very few had specific ocular complaints like thyroid disease, vascular malformation. No specific association was seen with age or systemic illness like diabetes mellitus, hypertension. Conclusion: Trochlear calcification is a benign condition with a typical location and morphology and can be inadvertently diagnosed as a foreign body or as an indication of underlying medical pathology.

KEYWORDS Trochlear calcification, CT scan

Introduction
Calcific foci detected in orbital non-contrast computed tomography (NCCT) can be due to numerous aetiologies like pathological calcifications varying from benign to malignant, foreign bodies and calcified trochlear apparatus.

Orbital pathological calcification detected in NCCT can be due to optic drusen, retinoblastoma, tuberous sclerosis, choriretinitis, hyperparathyroidism, pseudohypoparathyroidism, sarcoidosis and haemangioma etc[1]. Association between trochlear calcification and diabetic patient in less than 5TH decade of life has been strongly supported in earlier previous studies[2].

Materials and Methods
In this retrospective study, routine CT scans of random patients from December 2019 to December 2020 were reviewed. Requirement forms of these patients were analysed. The following criterion was tabulated accordingly; age, gender, ocular disorder and underlying systemic disorder after complete written and informed consent of the subjects and clearance from the ethical committee of the institute.

CT scan was done on a 16 slice Siemens multidetector CT scanner. Diagnosis of calcified trochlear apparatus was made upon detecting a high attenuated calcific focus at the superomedial aspect of the globe anteriorly along the course of superior oblique muscle (fig. 1). We assessed trochlear calcification’s occurrence and clinical presentation and its association with varying age groups and systemic disorders.

Associations between the variables were conducted using chi-square tests. Analyses of the odds ratio were done in detecting trochlear calcification among patients with diabetes mellitus versus non-diabetic and patients with a history of hypertension versus non-hypertensive patients. Data were analysed by using SPSS Statistics.

Result
A total of 220 CT scans of random patients from (0-79 ) years were enrolled in this study. Out of 220 subjects, a total number of 37 subjects had trochlear calcification, which was seen maximum in the age group of 40-49 years (TABLE 1). One hundred sixty-five patients were referred for a CT scan following trauma head. At the same time, the remaining had either vascular mal-
Table 1 Age distribution and patients with trochlear calcification.

| Age (years) | Trochlear calcification | Total | P value |
|-------------|-------------------------|-------|---------|
| 0-9         | 0                       | 48    |         |
| 10-19       | 6                       | 51    |         |
| 20-29       | 8                       | 31    |         |
| 30-39       | 9                       | 19    |         |
| 40-49       | 10                      | 28    |         |
| 50-59       | 3                       | 24    |         |
| 60-69       | 1                       | 11    |         |
| 70-79       | 0                       | 8     |         |
| Total       | 37                      | 220   |         |

\[ X^2 = 34.7 \]
\[ P < 0.001 \]

formation, thyroid disease other ocular conditions like cystic growth on the eyelid, dermoid, lipoma.

The coronal and axial CT section revealed 2mm to 4mm focus of calcification located adjacent to superomedial aspects of orbital walls bilaterally in one such subject (figure 1). Patients with trochlear calcification did not complain of restriction of eye movements or foreign body sensation, or any functional abnormality.

![Figure 1](a) axial section (b) coronal section showing bilateral calcific foci in superomedial aspect of orbital wall bilaterally.

When we compared the occurrence of trochlear calcifications in males (153) than those in females (63), The difference was statistically significant, as 31 male patients had trochlear calcifications. In comparison, only 6 female patients had the calcification. (TABLE 2)

Of the 220 patients, 14 patients had DM, 17 patients had hypertension, and 6 patients had both DM and hypertension. 3 patients with DM and 4 patients with hypertension among the 37 patients with trochlear calcifications. One of these patients both had DM and hypertension. Three patients (21%) of the 14 diabetic patients had trochlear calcifications, as compared with 34 (15%) of 216 non-diabetic patients (OR=1.73). Four (23.5%) of the 17 hypertensive patients had trochlear calcifications, as compared with 20 (9.4%) of the 213 normotensive patients (OR=3.276). (TABLE 3)

Discussion

Orbital trochlear apparatus is a saddle-shaped fibro-cartilaginous structure lined by synovial sheath located in the superior medial quadrant of the orbit through which the superior oblique tendon traverses, allowing an unrestricted pulley like mechanism. Trochlear apparatus per se has four components: - cartilage, superior oblique tendon, a fibrovascular sheath around the tendon and dense fibrous tissue [3]. The calcification detected in the trochlear apparatus can arise from any of the components described earlier, and it was beyond the limits of our study to make out the exact location of calcification detected in the trochlear apparatus [3] [4].

The prevalence of calcified trochlear apparatus ranges from 3-16%, as documented by previous studies[3].

A previous study [5] on 100 patients evaluated that 2% of those 100 patients had optic drusen bilaterally, and 3% had calcified scleral plaques and bilateral trochlear calcification each. Another article [6] stated a significant correlation of the trochlear calcification in patients with DM below the age of 40 years. As our study did not comprise any target group and most of the recruited CT scans were of younger age group with preceding history of trauma, we could not find any significant correlation of incidence of trochlear calcification among diabetic patent of the older age group.

In accordance with our result, there was no significant correlation between the occurrence of trochlear calcification and growing age or with any underlying history of systemic disease. Hence, we concluded that the occurrence of trochlear calcification is not an indication of degeneration or any underlying chronic illness.

Trochlear calcification was seen in all patient’s who had a history of acute trauma in our study, and the distinction between the trochlear calcification and intraocular foreign body was important. There has been a severe case in which trochlear calcification was misdiagnosed as a foreign body in the setting of trauma, as documented by Xiao et al. [5]. This distinction was made on the basis of location -calcification located in superomedial quadrant of orbit along superior oblique muscle was labelled as trochlear calcification while those found elsewhere in orbit were labelled as foreign bodies, morphology, as reported by Xiao et al [5], mostly three morphology of trochlear calcifications, were documented - comma-shaped, dot-shaped, and an inverted "U" shaped and symmetry- approx. 47% of trochlear calcifications are bilateral [1][4][6]. However, calcification does occur in trauma, but it takes a long time to appear, and none of our patients has a history of any orbital injury. Thus, on these bases, we concluded that these calcifications were incidental in origin.

The prevalence of trochlear calcification in our study was 16% which is in contrast to the previous studies that varied from 3-12% [1][2]. We also observed that it was more prevalent male
Table 2 Age distribution and trochlear calcification in male and female patients.

| Age (years) | Number of Patients | Male | Trochlear calcification | Female | Trochlear calcification |
|-------------|--------------------|------|-------------------------|--------|-------------------------|
| 0-9         | 37                 | 0    |                         | 11     | 0                       |
| 10-19       | 30                 | 4    |                         | 21     | 2                       |
| 20-29       | 22                 | 7    |                         | 9      | 1                       |
| 30-39       | 12                 | 7    |                         | 7      | 2                       |
| 40-49       | 20                 | 9    |                         | 8      | 1                       |
| 50-59       | 16                 | 3    |                         | 8      | 0                       |
| 60-69       | 9                  | 1    |                         | 2      | 0                       |
| 70-79       | 7                  | 0    |                         | 1      | 0                       |
| Total       | 153                | 31   |                         | 67     | 6                       |

Within gender among different age groups

\[ X^2 = 29.2 \quad p < 0.001 \]

\[ X^2 = 10.5 \quad p = 0.163 \]

Male vs Female

\[ X^2 = 4.26; \quad p = 0.039 \quad (M : F = OR = 2.58; \quad 95\% \quad CI = 1.02 - 6.53) \]

Table 3 Association of Trochlear Calcification with different coexisting morbidities

| SN | Condition | Cases without condition | Cases with condition | Statistical significance |
|----|-----------|-------------------------|----------------------|-------------------------|
|    |           | Total                   | No. with TC | % with TC | Total | No. with TC | % with TC | \[ X^2 \] | \( p \) |
| 1. | Hypertension only | 213 | 20 | 9.4 | 17 | 4 | 23.5 | \[ X^2 = 3.37; \quad p = 0.066 \] |
| 2. | Diabetes mellitus only | 216 | 34 | 15.7 | 14 | 3 | 21.4 | \[ X^2 = 0.315; \quad p = 0.575 \] |
| 3. | Both | 223 | 36 | 16.1 | 6 | 1 | 14.3 | \[ X^2 = 0.017; \quad p = 0.895 \] |

population than females and maximum patients had a history of trauma, owing to the fact that road traffic accidents and trauma are more seen in males.

We also found in our study that trochlear calcification did not lead to any orbital movement disability.

In conclusion, trochlear calcification is a benign condition with a typical location and morphology. However, it can be inadvertently diagnosed as a foreign body or an indication of underlying medical pathology. Thus, clinicians and radiologists must be aware of this entity on CT scans. The incidence of trochlear calcification is not uncommon, with a prevalence rate of 16% and is more common among males having no significant association with the aging process or any underlying chronic illness like DM or hypertension.

Conflict of Interest

Authors have no conflict of interest.

Author’s Contribution

All three authors contributed to data collection, interpretation, analysis as well as for the concept and design of the manuscript. All the authors reviewed and approved the final manuscript.

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