

DOES HYPERCHOLESTEROLEMIA PREDISPOSE TO ROTATOR CUFF PATHOLOGIES?

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ABSTRACT

Objective: Rotator cuff tear is one of the most common orthopedic musculoskeletal problem gaining importance due to large health scale expenditure. Causes of rotator cuff tears are multifactorial and unclear. The previous studies have suggested relation between elevated serum lipid profile and rotator cuff tear in the western population. We, therefore, undertook study in our Indian population to correlate the association of hypercholesterolemia with rotator cuff tear.

Methods: After obtaining clearance from the Institutional Ethics Committee. We prospectively collected fasting lipid samples of the population who came to our hospitals with complaints of shoulder pain during our study period. 50 patients had rupture of rotator cuff which was confirmed by ultrasound of involved shoulder. 50 were seen for non-cuff related complaints. We followed strict inclusion and exclusion criteria.

Results: Total cholesterol (TC), triglycerides, and low-density lipoprotein concentration of patients with rotator cuff tendon tear were on higher side than control group. High-density lipoprotein trend showed being lower than control group. 21 of 50 (42%) had high cholesterol (TC > 240 mg/dl) than compared to 18 of 50 (36%) in control group. However, $p=0.539$ and showed no statistical significance between groups

Conclusion: In Indian population, there was no correlation between hypercholesterolemia and rotator cuff tear which is statistically significant.

Keywords: Rotator cuff tear, Hypercholesterolemia, Indian population.

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INTRODUCTION

In industrialized nations, rotator cuff tear is one of the common orthopedic pathology mounting greater health costs [1]. The incidence of cuff tear increases with advancing age and, seen in 23% of people above the age of 50 years [2]. Trauma and degenerative conditions can cause a tear [3]. Among rotator cuff group supraspinatus is most commonly found to involve [4]. Although degenerative tears are common [5], still exact cause is unclear. Theories, such as intrinsic and extrinsic, have been proposed for degenerative tears.

Neer proposed that coraco acromial arch impinges on anterior part of cuff in overhead activities and predispose to tear [6]. Degeneration in tendon weakens cuff and trivial trauma through it can cause massive tear [2]. However cause is still yet to be cleared, studies have shown, rate of cuff tear increases as body mass index (BMI) goes up [7]. Oxidative stressors [8] induce apoptosis [9] in tenocytes, inflammatory mediators aggravate degenerative changes in the cells and add on to burden [7,10]. However, still age plays upper hand and repeated insults cause chronic changes in tendon and these undergo massive tear following trauma [2].

In substantiating risk factors for cuff pathology, studies were done; there were few studies which showed raised serum cholesterol in patients with Achilles tendon ruptures [11]. This study was performed in the western world and patients with rotator cuff tear were found to be hypercholesterolemic [4]. But there are no Indian studies done till now to find out Indian population also have cuff problem due to raised cholesterol. Hence we undertook study to find association between hypercholesterolemia and rotator cuff disease in our population.

Cholesterol is vital for human survival and major sources of energy. In humans, cholesterol is found to be in two forms as good and bad cholesterol and our body metabolizes cholesterol. Our diet practice and level of activity, habits like alcohol, smoking and even genetics [12-15]

influences our lipid level. The National Cholesterol Education Program defines hypercholesterolemia as blood cholesterol concentration more than 240 mg/dl [16].

We, therefore, undertook a study in our population to substantiate cholesterol as risk factor in the aetiopathogenesis of rotator cuff tear.

METHODS

After obtaining approval from the Institutional Ethics Committee, all patients who had been clinically and imaging wise diagnosed to have rotator cuff tear were prospectively selected during the study period between October 2014 and August 2016. All participants were informed about purpose and details of the study via patient information sheet; consent was signed by each participant before taking part in the study.

We included patients who had clinical diagnosis for rotator cuff tear, by authors in study by clinical examination and imaging by X-ray/ultrasound of shoulder done by senior radiologist.

We excluded: (1) Previous surgery on affected shoulder, (2) smokers, (3) history of shoulder infection, (4) chronic steroid use, (5) frozen shoulder, (6) younger than 21 years, (7) calcific tendinitis, and (8) tendinopathy.

We obtained fasting samples for lipid profile estimation of 50 patients who came to our hospitals for the treatment of rotator cuff pathology. These 50 patients, with tear of rotator problems, were grouped as case group. We also collected samples from 50 people who had shoulder symptoms with intact rotator cuff and these were grouped as control group.

In the case group, we had 50 patients, out of which 14 were females. Mean age of the patients was 49.04 years. 3 people were below 30 years, 10 were between 31 to 40 years and 12 people were between 41 to 50 years, and 25 people were above 50 years (Fig. 1). 36 of them

were right handed dominance, 80% of tears were found in dominant extremity. In our group, 56% patients had pure supraspinatus tear, 24% had supra and subscapularis tear and 10% had supra and infraspinatus tear and remaining had complete cuff tear (Fig. 2). 10% of our patients sustained injury while playing, 25% sustained injury while involved in occupational activities, 5% gives history of road traffic accidents (RTA) and others does not remember the mechanism of injury but they complained of insidious onset of pain.

In our control group: We collected first 50 patients who came during our study period. Mean age was 47.7 years, out of which 7 were females. 3 people were below 30 years, 8 were between 31 to 40 years and 18 were between 41 to 50 years, and remaining 21 above 50 years (Fig. 1). 38 patients were right hand dominant and 52% had pain in dominant extremity. All patients met inclusion and exclusion criteria; they were clinically (if applicable) and radiologically confirmed to have intact rotator cuff. 42% patients had clavicle fracture and 28% had proximal humerus fracture and 20% had sub acromial bursitis 8% had acromioclavicular joint arthritis. In our study, 70% gives history of RTA, 12% history of fall from height at work place and others does not remember mechanism of trauma (Fig. 3).

In all patients, we noted age, sex, and detailed history was taken to know mechanism of trauma, previous history, BMI was recorded, and detailed shoulder examination was done. We looked for signs of previous surgery, associated deformity, signs of previous infection, and associated ill ness, and we recorded movements around shoulder using goniometer and examined rotator cuff muscles. [17-21]

We got ultrasound of shoulder done by senior radiologists to look for tear. X-ray of shoulder done to look for associated pathology. We

obtained fasting sample for lipid profile estimation and was collected within 5 days of diagnosis of condition and it was run through analyzer and obtained high-density lipoprotein (HDL), low-density lipoprotein (LDL), total cholesterol (TC), and triglycerides (TG).

Our study was a case control type study, and statistical data analysis was performed using odds ratio and Chi-square test using SPSS version 17.

RESULTS

In the case group, 21 out of 50 patients (42%) (range 130-321) had high cholesterol (TC > 240 mg/dl) than compared to control group 18 out of 50 (36%) (range 132-301 mg/dl) (Figs. 4 and 5). p=0.539 shows no statistical association between groups.

About 13 out of 50 (26%) of rotator cuff tear group showed high TGs than 12 out of 50 (24%) in control group showed more than 200 as high. p=0.817 shows no significance between associations.

About 18 out of 50 patients (36%) of the cuff tear group had low HDL than compared to 16 out of 50 (32%) in control group (normal range <40 mg/dl) as low HDL however p=0.663 shows no statistical significance.

About 16 out of 50 (32%) of tear group had high LDL than compared to 14 out of 50 (28%) in control group (normally more than 160 mg/dl as high) however p=0.673 shows no statistical significance.

p value for our study was set to be below 0.05 at power of 95%, but our study shows no statistical differences between groups (Fig. 6).

Our study shows no statistical (p=0.539) association between hypercholesterolemia and rotator cuff tear in our patients. TC, TG, and LDL in patients with rotator cuff tear group were on higher side

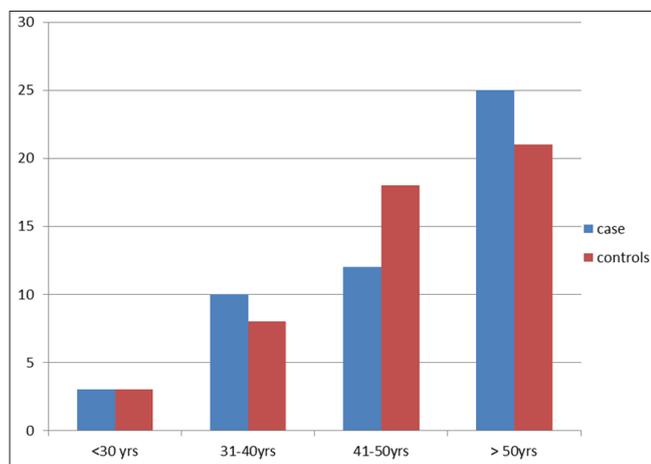


Fig. 1: Age distribution

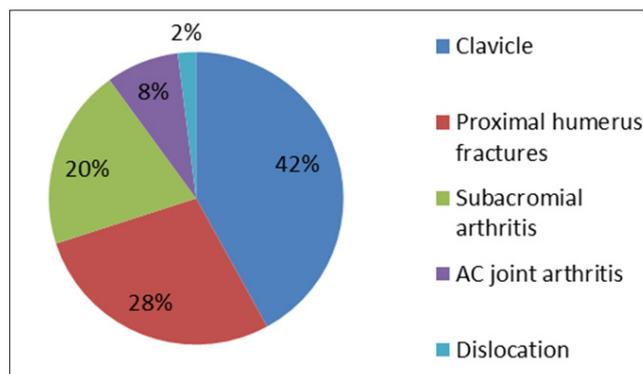


Fig. 3: Control group statistics

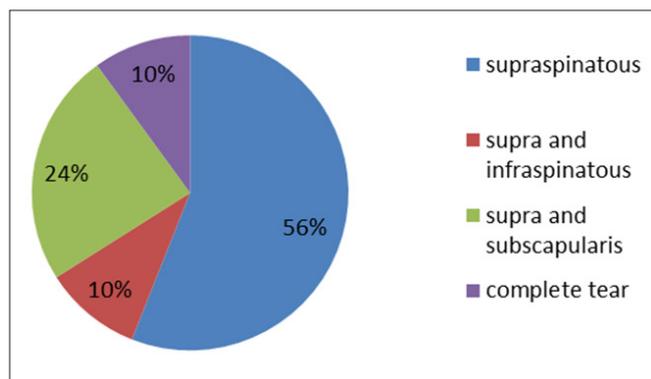


Fig. 2: Tear pattern in case group

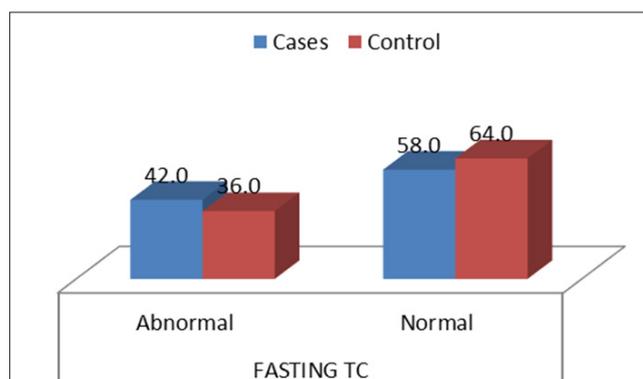


Fig. 4: Total cholesterol

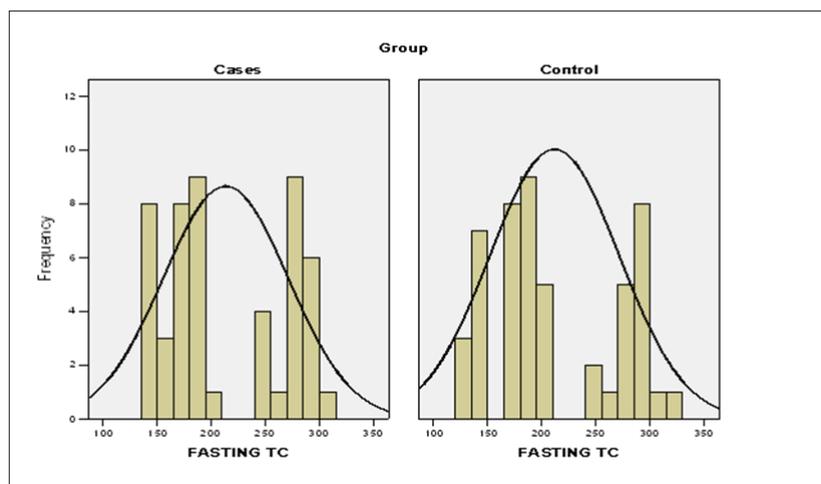


Fig. 5: Total cholesterol distribution in study

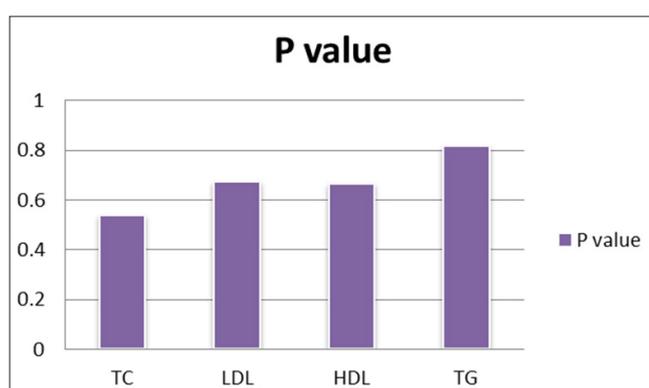


Fig. 6: p value

than compared with cuff intact group. HDL was on the lower side than compared to cuff intact group.

DISCUSSION

Rotator cuff is group of muscles which are subjective to repeated stress; there are principally four muscles which constitute them. There are several causes for rotator cuff tear and still not clear. Study on rotator cuff started with Neer who hypothesized that rotator cuff tear was due to impingement of cuff by coracoacromial arch in overhead activities [6]. Biglani proposed that morphological changes in acromion process lead to weakening of cuff which later gets ruptured [22].

Studies have shown oxidative stress [8,23] induces tenocyte apoptosis. As age advances degeneration sets in, cells loses its integrity; there will be myxoid and hyaline degeneration and fatty degeneration [24-26] in tenocytes of cuff and precipitate to tear for any trivial insult.

Study done by Mathiak *et al.* found high cholesterol in 83% of people with Achilles tendon ruptures [11]. Klemp *et al.* showed musculoskeletal manifestation found in 38% of juvenile hypercholesterolemia and showed soft tissue manifestation resolved in 63% of patients after receiving antilipidemics [27]. Harvie *et al.* show that genetic factors do play a role in cholesterol deposition and found siblings of cuff tear patients have full thickness rotator cuff tear [12]. Crouse *et al.* showed even normal connective shows deposition of cholesterol as age advances [28]. Abboud and Kim showed that 63% of patients with rotator cuff tear had raised cholesterol [16].

Hence, we undertook study to find out whether there is correlation among Indians and found no statistical association between groups in our study, however, there was high cholesterol and high LDL and

low HDL and high TG's between groups but did not reach statistical significance level.

Our study has several limitation: (1) We did not have histology correlation for confirmation of diagnosis, we could limit it by having histology studies. (2) We analyzed people who came to our hospital predominantly they were people of our locality, we had selection bias, we can limit it by large multicentric trial across India. (3) Patients who came to us may not be representative of whole population (habits, gender). (4) We did not assess other parameters which could have contributed to tear like role of exercise, diet habits, triviality of injury, comorbid illness, we can eliminate it by correlating associations and by having multiple variables.

Strength of our study we had kept our study power about 95%. We have used ultrasound as proof for tear, ultrasound is cheap, economical, and has sensitivity comparable to magnetic resonance imaging.

CONCLUSION

We conclude that Indians does not show a correlation between hypercholesterolemia and rotator cuff pathologies. Further studies required to add on to this study power. Large multicentric trials need to be done to find out the association. Further research needs to be done on rotator cuff degeneration module to find out pathomechanics of cuff tear which could add on to our treatment protocol.

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