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An Insight in to Cadaveric Ectopic Calcification: A Case Report

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Abstract: ***Pathological Calcification is an anomalous accumulation of calcium salts along with minimal quantities of iron, magnesium and other minerals in bodily tissues except teeth and bone causing hardening of the affected tissues. The location of the calcification and the presence or absence of mineral balance can be used to categorize it. The atypical mineral deposition processes in biological systems can sometimes be referred to as pathological calcification. During the routine dissection in National Institute of Ayurveda, Jaipur it was observed that numerous pathological calcifications were present both on osseous and extra osseous sites which were different from the normal human anatomy. The subject was a 90-year-old male of North Indian origin. Case examples illustrate different types and locations of calcification, shedding light on the anatomical distribution and potential clinical relevance.***

Keywords: calcification, ectopic, soft tissue, CKD, cardiovascular, aging

I. INTRODUCTION

Calcification is a controlled and coordinated physiological process occurring in bones and tissues. Nonetheless, calcification is frequently observed in soft tissues as a result of increasing age and a number of diseases. It is commonly known that calcification and aging poses a risk for mortality and cardiovascular disease. When it comes to aging and end-stage atherosclerosis, calcification was once thought to be a passive degenerative dystrophic process. However, more recent research has shown that calcification is actually a complex, regulated biological process that is linked to the crystallization of hydroxyapatite in the extracellular matrix, which causes arterial stiffening. Generally extra osseous calcifications occur as an end result in chronic renal disease. Herein calcifications were contributed due to CKD as well as aging. Cadaveric studies offer a unique opportunity to explore extraosseous calcification in a controlled anatomical setting. Understanding the prevalence, distribution, and characteristics of these calcifications enhances knowledge of pathological processes and aids in clinical management strategies.

II. MATERIAL AND METHODS

A routine dissection was carried in the department of Rachana Sharir, national Institute of Ayurveda, Jaipur , Rajasthan. A 90-year-old formalin fixed male cadaver of North Indian origin was sourced for this purpose. The human cadaver used in the dissection was obtained through our department's body donation programme following all ethical guidelines. The cadaver was embalmed using all the possible measures which ensured the structural integrity of the tissues thus making it suitable for prolonged use for educational and research purpose. The dissection was performed systematically and all sterile instruments were used to serve the purpose. While dissection numerous sites of calcified areas were noticed, which were then taken into consideration and vascular, skeletal , soft tissue structures, viscera and the organs were scrutinised for the evidences of calcification. This study aims to collect and examine all possible areas of calcification.

III. CASE REPORT

The dissection was done in the department of Sharir Rachana, National Institute of Ayurveda, Jaipur. These pathologies were found while dissecting an approximately 90-year-old formalin fixed cadaver of North Indian origin. The body was donated voluntarily and the formalin fixed entire body was observed for this study. Arteries, veins, soft tissues and viscera of organs were deeply studied and noted in this subject during routine dissection. Evidences of calcifications were found in the heart over the left subclavian artery, left common carotid artery , brachiocephalic trunk alongside arch of aorta. As the dissection proceeded further evidences were found on the abdominal aorta, left and right internal iliac arteries. Similar instances were seen on the costochondral junction of the ribs and

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visceral calcifications over the diaphragm were observed alongside. Various sites of ectopic calcification as a result of aging and Chronic Kidney Failure were noted in this subject.

Cadaveric dissections revealed extraosseous calcification in various anatomical locations:

1) *Arterial Calcification:* The intima and the media are the two separate locations in the artery wall where vascular calcification takes place. While medial calcification can exist independently of atherosclerosis and is linked to elastin and vascular smooth muscle cells, intimal calcification happens in the context of atherosclerosis and is connected with lipid, macrophages, and vascular smooth muscle cells. Evidence of calcification observed in major arteries, contributing to vascular stiffness and potential implications for cardiovascular health. Evidences of arterial calcifications were observed in major vessels emerging out of heart which are left subclavian artery, left common carotid, brachiocephalic trunk and arch of aorta (as shown in fig 1.1). Other such occurrences were observed in left and right iliac arteries (as shown in fig 1.2) and an enormous calcified region was observed on the descending thoracic aorta as shown in fig 1.3). Vascular calcifications are characterized by parallel tubular calcifications resembling railroad tracks in association with blood vessels.

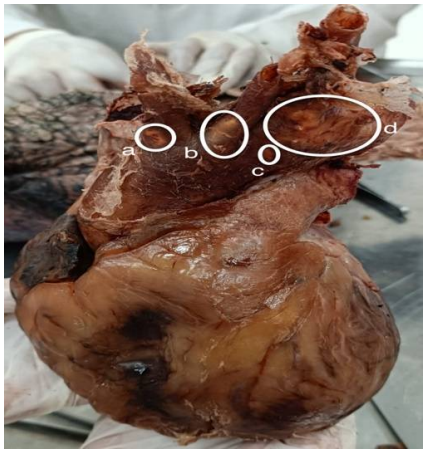

Figure 1.1: depicts calcification in a: brachiocephalic trunk, b: left common carotid artery, c: arch of aorta, d: left subclavian artery
Figure 1.2: depicts calcification in right and left iliac arteries

Figure 1.3: marked region in the figure depicts calcification in descending thoracic aorta

2) *Soft Tissue Calcification:* Calcific deposits found in joints (e.g., calcific tendinitis), ligaments, and other soft tissues, affecting joint mobility and function. Large rodlike (secretory) calcifications represent calcium deposits within ectatic medium and large ducts. These calcifications are usually bilateral and appear as discontinuous, smooth, thick rods in a ductal distribution. Herein

numerous the calcifications were seen on the ribs on the costochondral region as encircled. The shape of calcification was roughly rod like and almost 1.1 cm in length

Figure 2: marked area in the figure depicts rod shaped calcification on the costochondral junction of the ribs

3) *Visceral Calcification:* Occurrence of calcification in visceral organs such as kidneys illustrating potential impacts on organ function and pathology. In this cadaver unusual visceral calcifications were seen on diaphragm which were around three in number with irregular shapes hence of varying measurements as encircled in the figures below.

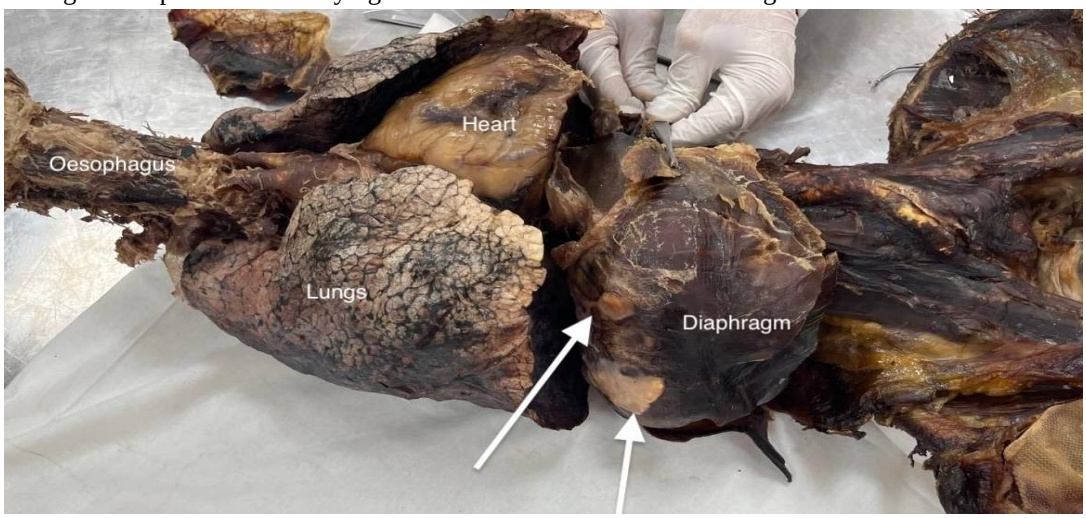

Figure 3.1 : figure depicts marked areas of calcification over diaphragm

Figure 3.1 1 : figure depicts marked areas of calcification diaphragm

Figure 3.2 : figure depicts marked of calcified areas over over diaphragm

IV. RESULT

A. Cadaveric Specimen

1) Sample Characteristics: The study included cadaveric specimen sourced from Department of Rachana Sharir, National Institute of Ayurveda, Jaipur, with an approximate age of 90 years . The gender distribution and origin was North Indian male

B. Macroscopic Findings

Distribution

1) Anatomical Sites: Calcifications were predominantly located in vessels of heart [particularly in brachiocephalic trunk, left common carotid and left subclavian artery and arch of aorta further descending downwards to right and left iliac arteries], including viscera [particularly diaphragm] and costochondral junction of ribs.

2) Size and Appearance: The calcifications varied in size from 1.1cm length to a diffuse range, appearing as rod shaped in costochondral junction and diffused and flattened over the diaphragm and rest of the areas.

V. DISCUSSION AND CONCLUSION

The anatomical exploration of extraosseous calcification in cadaveric specimens provides insights into the localization and extent of calcified deposits. These findings underscore the clinical relevance of understanding calcification patterns in diseases such as atherosclerosis, calcinosis, and renal calculi. The findings reveal a significant prevalence of calcifications across various anatomical sites, particularly in the cardiovascular system including brachiocephalic artery, common carotid artery, left subclavian artery and arch of aorta in the heart further descending thoracic aorta and right and left iliac arteries. These instances of calcification were also found in costochondral junction of ribs and over diaphragm as shown below in the figure 4.

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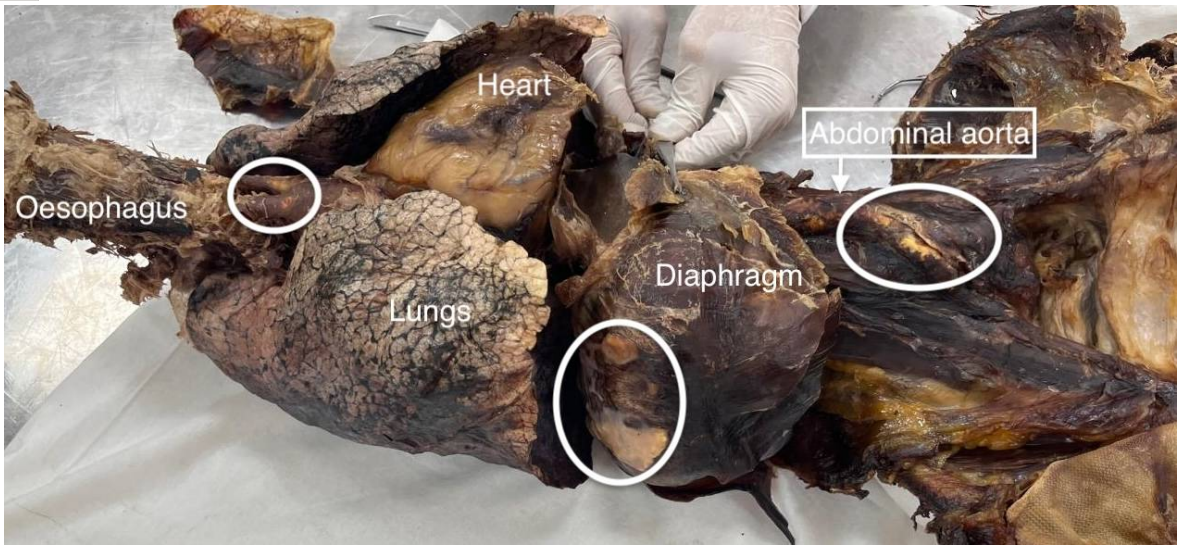

Figure 4 : depicts insitu arrangement of viscera with marked areas of calcification in heart, abdominal aorta and diaphragm

The correlation with age underscores the progressive nature of calcification and its potential clinical implications. Further research is warranted to elucidate the pathophysiological mechanisms underlying calcification and to explore therapeutic interventions aimed at mitigating its impact on patient outcomes. This structure provides a comprehensive overview of the results section, anatomical distribution, clinical correlations, and statistical analyses related to calcifications in the human body.

VI. CLINICAL IMPLICATIONS

This article synthesizes anatomical findings from cadaveric study to elucidate the complexities of extraosseous calcification, utilizing visual examples to illustrate diverse manifestations and clinical implications. It underscores the value of cadaveric research in advancing our understanding of calcification-related diseases. Vascular calcification seen on radiography is well acknowledged as a sensitive indicator of atherosclerosis. Plain radiographs, which are a somewhat insensitive method of detecting aortic calcification, were the first to show a connection with clinical prognosis.

Knowledge gained from cadaveric studies informs clinical practice by enhancing diagnostic accuracy and guiding therapeutic interventions. Recognition of extraosseous calcification patterns aids in early detection and management of associated diseases, improving patient outcomes.

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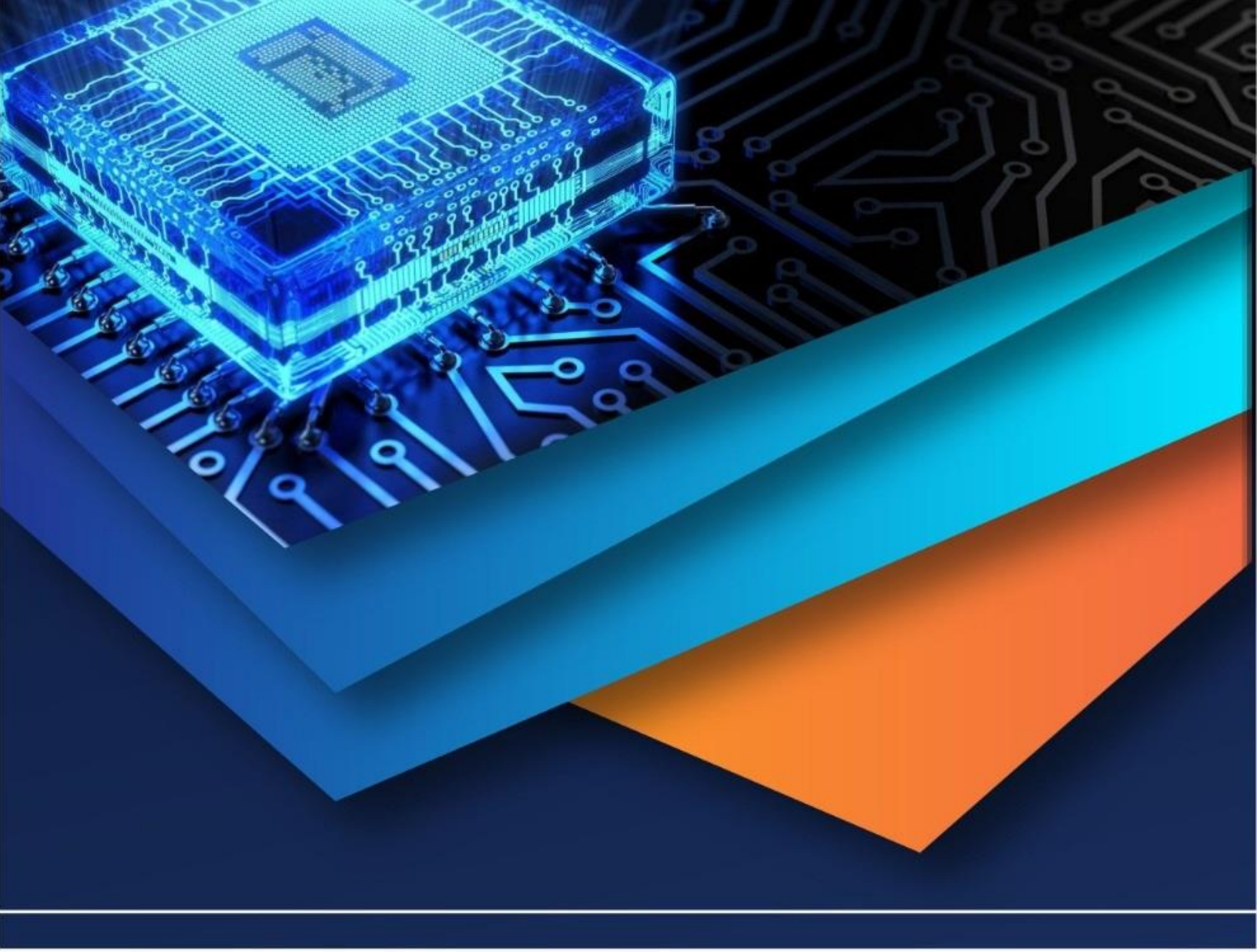

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