



Early Calcifications of Costal Cartilages in Patients At Gujarat Adani Institute of Medical Science, Bhuj, Kutch, Gujarat, India

KEYWORDS

Calcification, Costal cartilages, Kutch, Porphyria

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ABSTRACT *Background and Aim:* Calcifications of the costal cartilages occur, as a rule, not until the age of 30 years. The aim of this paper is to call for further research in this area since it is unlikely that premature calcifications of costal cartilages are normal variants in skeletal radiology. *Materials and Methods:* The present study was carried out at Department of Radiology, Gujarat Adani Institute of Medical science, Bhuj, Kutch, Gujarat, India. A search was made to find patients below the age of 31 years who showed distinct calcifications of their lower costal cartilages by viewing 350 random samples of intravenous pyelograms and abdominal plain films. The histories, and clinical and laboratory findings of these patients were analyzed. *Results:* Eighteen patients fulfilled the criteria of premature calcifications of costal cartilages (CCCs). Premature CCCs were often associated with rare endocrine disorders, inborn errors of metabolism, and abnormal hematologic findings. Among the metabolic disorders there were 2 proven porphyrias and 8 patients with a suspected porphyria but with inconclusive laboratory findings. *Conclusion:* Premature CCCs are unlikely to be a normal variant in skeletal radiology. The findings in this small group of patients call for more intensive studies, especially in regard to the putative role of a porphyria.

Introduction

The calcification of the costal cartilages follows gender related patterns and is frequently not obvious radiographically until after the age of 30 years¹. The forms and the onset of these calcifications were used to choose the gender and the age of anonymous bodies in the forensic medicine²⁻⁴; however, the clinical significance of early calcifications of the lower rib cartilages is not fully elucidated as yet. In case reports, there have been descriptions of an relationship of premature calcifications with hyperthyroidism⁵⁻⁶, corticosteroid medication⁷, and rare congenital diseases such as adrenogenital syndrome^{8,9} or Keutel syndrome^{10,11}, but some authors regard even extensive costal cartilage calcifications (CCC) as a normal finding or variant¹². Some years ago, approximately 1968, a search was made for premature CCCs according to the criteria described below.

Age is not the sole factor for development of calcification. Premature costochondral calcification is associated with infections, mineral metabolism, thyroid disease, chronic renal failure, some malignancies and genetical factors. Sexual difference in the human costal cartilage patterns is predictive for sex determination. In the lower ribs males tend to show calcification at the periphery of the cartilage, however females have central, tongue like calcification pattern. CC correlated with many pathological situations as arteriosclerosis, nutritional problems, metabolic or endocrine changes. Often irregular outline with radiolucent transverse linear zones could simulate fracture¹³. Idiopathic costal cartilage calcification may occur in children as well as in adults, appears very dense, symmetric, and homogeneous lesions, but usually they have no pathologic significance

The knowledge of the clinical significance of early and extensive calcifications is still incomplete the aim of this paper is to call for further research in this area since it is unlikely that premature calcifications of costal cartilages are normal variants in skeletal radiology.

2. Materials and Methods

An investigation was made for patients who demonstrate wide or absolute calcifications of their lower costal cartilages and whose age was below 31 years. The present study was carried out at Department of Radiology, Gujarat Adani Institute of Medical science, Bhuj, Kutch, Gujarat, India. Ethical clearance was obtained from institutional board of college and informed consent was taken from all the participants. Premature costal cartilage calcifications (CCCs) were found by viewing intravenous pyelograms and plain radiographs of the abdomen.

In case of abnormal calcifications, consent was obtained to study the charts of those patients that were treated in different departments of the hospital. The histories, the clinical and laboratory findings, and the suspected diagnoses of 18 such patients were analysed and put together.

In order to roughly assess the frequency of CCC, we have screened about 350 abdominal plain films and intravenous pyelograms of people in the age of 18 to 31 years by taking random samples. Eighteen cases of definite CCC were found. Calcifications were termed complete if the entire cartilage from the costal to the sternal end was calcified area-wide. Intensive or advanced cartilage calcification was noted if at least 50% of the area was involved, independent of the form of calcifications which might be different in males and females.

Results

Definite CCCs were diagnosed in 18 young patients by spot checks. There were 15 females and 3 males. The most common reason for a hospitalization was abdominal pain of unidentified source in 13 of 18 cases.

In the history of the patients a proneness to infections was observed. In majority of cases conflict at the urogenital system, mainly pyelonephritis or cystitis, were diagnosed. Eight patients had clinical symptoms suggestive of a porphyria. Two patients showed abnormal levels of

delta-aminolevulinic acid (ALA) and porphobilinogen in the urine, and both patients were ultimately proven cases of an unspecified porphyria. The majority of the patients had metabolic disturbances, and some of them showed rare diseases (Table 1).

Noticeable are pathological findings of endocrine organs. Addison's disease was diagnosed once and degenerative or neoplastic diseases of the gonads are diagnosed in 3 cases. The menstrual cycle was disturbed in further 5 patients. One case of Addison's disease was unusual in so far as the case presented as an idiopathic, familial form that showed normal levels of sodium and potassium in the serum.

The main respective findings of the patients were summarized in Table 1.

Table 1: Selected clinical findings in 18 patients with premature calcifications of the costal cartilages

Sr no	Age/sex	Metabolic disorder	Diseases of endocrine organs
1	17/F		Ovarian teratomas, bilateral
2	18/F	Suspected porphyria	Ovarian cysts
3	21/F		Hyperthyroidism
4	23/M		Morbus Addison
5	22/F	Porphyria, unspecified	Bilateral ovarian cysts
6	26/M	Suspected porphyria	
7	19/F	Suspected porphyria	
8	27/F	Cholelithiasis	
9	25/F	Suspected porphyria	
10	22/F		Hypothyroidism
11	21/F		Oligomenorrhea
12	29/F	Cholelithiasis	
13	19/F	Suspected porphyria	
14	20/F	Orotic aciduria, suspected porphyria	
15	25/M		
16	21/F	Porphyria, unspecified	
17	28/F		Ovarian cysts, follicular
18	22/F		Microcystic degeneration of the right ovary

A variety of hematologic alterations were noted. Six presented with anemia of moderate to severe degree. The bone marrow of the one patient showed a severe disorder of the maturation of the erythropoiesis. Two other patients showed a strong transfer to the left in the differential leukocyte counts over months. There was no clear reason for this shift to the left.

Discussion

Disorders of endocrine organs were found in a strange occurrence in our patients. Already in 1955, Fischer suggested to search for endocrine disorders in case of premature calcifications of the rib cartilages¹⁴ The full representation of an adrenogenital syndrome could never be proven in our patients, but some of its manifestation were seen, for example, a partial insufficiency of the suprarenal glands or an increased excretion of androgen metabolites in the urine. Fascinatingly, in Addison's disease extensive calcifications of the ear cartilages were described. However, it seems to be of partial value to deal here with the details of the extensive experimental work concerning the influence of hormones on CCC which was performed in earlier decades¹⁵. Main symptoms were related to recurrent ab-

dominal pain. Somehow, this may be due to the selection of intravenous pyelography and abdominal plain films for screening of CCC, and this of course implies a prevalence of urogenital and abdominal disorders to some level. On the other hand, the origin of the abdominal pain attacks remained often unsolved in these patients. In the circumstance of an abnormal secretion of porphobilinogen in the urine of three patients, one has to consider the event of true porphyrias. At present, there is lack of certainty on the diagnosis of acute intermittent porphyria in some cases since the adequate work-up was not done and since there is apparently a lack of being familiar with these diseases.

During the last two decades important advances in the understanding of the porphyrias were made: specific enzyme deficiencies have been demonstrated, and genes have been isolated and located. Thereby it is evident that there is a great deal of genetic heterogeneity in each porphyria¹⁶.

There were several hematologic abnormalities among patients in present study, sometimes linked with a cyclic course. It remains open whether these abnormalities are separate diseases or are connected to variants of a porphyria. Hematopoietic alterations within porphyric disorders are not well defined. Oubre et al.¹⁷ described an association of porphyria cutanea tarda with a myelodysplastic syndrome.

Taken together, early CCC seems to be connected with a variety of endocrine and/or metabolic disorders, acquired or inherited. Apart from Keutel syndrome¹⁸ the common pathway leading to early calcifications is unknown as yet. The part played by and the ratio of potential porphyrias in CCC remain likewise uncertain.

The frequent occurrence of unclear abdominal pain syndromes in this small cohort of patients calls for further investigations by colleagues from internal medicine or specialists of porphyrias. If a relationship of premature CCC and porphyrias could be confirmed, this uncomplicated sign in abdominal X-rays would facilitate the thinking about the diagnosis of a porphyria which is still unnoticed too often. So, in the lack of conclusive scientific clinical data, the significance of this work is to persuade further studies as to the attractive phenomenon of CCCs.

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