

Pattern of radiological features of Pulmonary and Skeletal system in HIV infected children

Ramesh R Pol, Manswini R Pol¹, Raghavendra Vanaki, BC Yelamali

Department of Paediatrics, ¹Department of Radiology, S. Nijalingappa Medical College, Bagalkot, Karnataka

Abstract

Objective: To determine the prevalence and radiological pattern in pulmonary and skeletal system of HIV infected children.

Subjects and methods: Serologically positive 62 children between the age group of 18 months to 12 years were studied from October 2010 to March 2012 (1 1/2 years period) admitted to pediatric ward SNMC, Bagalkot. All children were taken chest x ray and knee radiographs irrespective of symptoms at the time of first presentation. A single radiologist experienced in the field analyzed the radiographs.

Results: Number of HIV seropositive children admitted during study period was 62. Of the 62 children, 29 children had abnormal chest x-ray and 30 had abnormal knee x-ray. Among the abnormal chest x-ray, bronchopneumonia (41.38%) was most common followed by Pneumocystis Carinii Pneumonia (17.24%), and osteopenia (33.33%), osteoporosis (23.33%) and scurvy (36.67%) were more common findings on knee x-ray.

Conclusion: Routine chest and knee x-ray, will help in early diagnosis and timely treatment and help in increase in life expectancy of these children and micronutrient correction.

Key words: radiological features, pulmonary, skeletal system, HIV infection.

Introduction

HIV infection/ Acquired Immuno-deficiency Syndrome is a pandemic with raising trend of infections. Nearly all patients infected with HIV experience respiratory infection and micronutrient deficiencies at some point in the course of their illness. Recurrent pneumonia and tuberculosis are currently the most common causes of respiratory diseases and osteoporosis and scurvy are common skeletal changes seen in HIV infected individuals in developing countries, and are frequently the first clinical manifestation of HIV infection.

An important diagnostic tool in assessing the complication as well as manifestations of HIV infection is the x-ray (both chest and knee). X-rays are widely available and relatively inexpensive especially for children of developing countries in the assessment and management of acute and chronic disease in HIV infected children [1]. They provide an initial differential diagnosis and also provide a

radiological baseline before initiation of ART [2] and monitor treatment response, including the development of immune reconstitution inflammatory syndrome (IRIS).

HIV infection has been studied extensively in adult age group. But pediatric HIV infection is a relatively newer field and has not been extensively studied in Indian children. There are only few published reports on radiological pattern of pediatric HIV infection in India. Considering all these, the present study was conducted at S. Nijalingappa Medical College, Bagalkot.

The aims of this study are therefore is to determine the prevalence and to identify the radiological pattern / changes that are characteristic of HIV infection as seen on chest and knee radiographs and the radiological features which predominate at specific levels of immune suppression which could narrow the differential diagnosis.

Subjects and methods

Address for Correspondence

Dr. Ramesh R Pol, Associate Professor of Paediatrics,
S. Nijalingappa Medical College, Bagalkot-587102, Karnataka.
E-mail:-rameshpol@ymail.com

All serologically positive children admitted in pediatric ward of S. Nijalingappa Medical College, Bagalkot, between the age group of 18 months to 12 years were studied from October 2010 to March 2012 (18 months period). Clinical manifestations, a complete physical examination and laboratory investigations were recorded in predesigned proforma. Protein energy malnutrition was graded as per IAP classification. All children were taken chest x-ray and knee radiograph irrespective of their symptoms at the time of first presentation. Wrist x-ray was taken in clinically suspected rickets. Children who were already on Anti-Retroviral Therapy and age less than 18 months were excluded from the study. Children below 18 months were not included in the study because of diagnostic difficulties. A single radiologist experienced in the field analyzed the radiographs.

Sixty two children with confirmed HIV infection were included in this study. As low bone mineral quality or density in patients can be considered as a marker of possible degeneration in osteopenia and osteoporosis in adulthood, we evaluated bone features along with pulmonary features in a pediatric population. Bone mineral density (BMD) of both knee joint was measured by Dual Energy X-ray Absorptiometry (DEXA). Osteopenia was considered when BMD values lies between 1SD and 2.5SD and osteoporosis when BMD is <2.5 or more.

Results

A total of 62 confirmed cases of HIV infected children were studied during study period. The age range was from 18 months to 12 years with mean age of presentation was 5 1/2 years. The maximum cases in the study were males, constituting 62.9% (39) i.e.2/3 of cases. According to IAP classification, 39 (62.9%) had severe malnutrition. Most of the children with abnormal x-rays were severely malnourished, accounting for almost 70% of cases.

Of the total cases, 33 (53.22%) cases had normal chest x-ray finding. 29 (46.78%) cases had abnormal chest x-ray findings (Table 1). Non-homogenous patchy opacity suggestive of bronchopneumonia was noted in 12 (41.38%) cases. Pluffy shadows suggestive of Pneumocystis Carinii Pneumonia (PCP) were noted in 05 (17.24%) cases.

Cystic lesions suggestive of bronchiectasis were noted in 03 (10.34%) cases. Pleural effusion was noted in 03 (10.34%) cases and hilar lymphadenopathy was noted in 04 (13.79%) cases.

All sixty-two children were taken knee x-ray. Of these, 32 (51.61%) had normal knee x-ray and 30 (48.39%) had abnormal knee x-ray findings (Table 2). Osteopenic and osteoporotic changes were noted in majority (56.66%) of the cases, followed by scurvy changes noted in 11 (36.67%) children. Ricketic changes were noted in 02 (6.67%) cases. Most of these babies were severely malnourished.

Table 1. Table showing abnormal chest x-ray: n=29

X-RAY FINDINGS	NO. OF CASES	%
Non homogenous patchy opacity	12	41.38
Pluffy shadows (PCP)	05	17.24
Cardiomegaly	05	17.24
Hilar lymphadenopathy	04	13.79
Cystic lesion (Bronchiectasis)	03	10.34
Pleural effusion	03	10.34
Homogenous opacity	02	06.90
Collapse	02	06.90
Miliary mottling	01	03.45

Table 2. Table showing abnormal knee x-ray: n=30

X-RAY FINDINGS	NO. OF CASES	%
Osteopenia	10	33.33
Osteoporosis	07	23.33
Scurvy	11	36.67
Rickets	02	06.67

Discussion

The radiological features of the disease on chest radiograph are usually described as being bizarre or atypical. The chest findings are usually strange or different from the common patterns [3,4]. However, these changes have been found not to be pathognomonic or specific to HIV infections alone [3,4,5,6,7]. Identification of carriers of the disease, who may not want to reveal their HIV status because of social stigmatization, may be made possible through the findings on the chest radiograph, when on routine medical checkup or with child presenting with severe respiratory distress.

Most of the studies reveal that efforts have been made in the recent past to itemize the chest manifestations in the AIDS patients, but no uniform accepted protocol is yet available for the radiological evaluation of the chest radiograph. These radiological features do not correspond to the level of immune suppression or CD4 counts.

The baseline chest radiographs in these children are predominantly normal (53.3%), but a significant number of children also have pathological radiological features (46.7%), this is similar to the Plessis et al [8] study which shows 46% abnormal chest x-rays.

Pulmonary disease is the most common clinical manifestation of HIV in infants and children [9]. This correlated well with our results, which demonstrated pulmonary parenchymal disease to be the most common (60%) pathological radiological finding. Air space disease was seen in nearly a third of children.

Bronchiectasis can occur either as the sequel to repeated infections or due to traction phenomenon in LIP but is often multifactorial [10]. Cardiomegaly in HIV infected children may be due to dilated cardiomyopathy (most common), pulmonary pathology, anemia, pericardial disease or HIV related obstructive pulmonary vascular disease [11].

A meta-analysis of studies published between 1966 and 2005 showed bone absorptiometry results indicating osteoporosis in 15% of HIV patients and osteopenia in 52% [12]. In our study, the osteoporosis was seen in 23.33%, osteopenia in 33.33% and scurvy in 36.67%. The pathogenesis of alteration of bone turnover are still unclear and is thought to be multifactorial. The suggested risk factors includes longer duration of HIV infection, high viral load,

malnutrition, disorders in calcium and phosphate metabolism, and HIV infection per se.

Deficiencies of micronutrients are common in HIV-infected persons. They occur due to malabsorption, altered metabolism, gut infection, and altered gut barrier function. The deficiencies of micronutrients in HIV infection are associated with immune deficiency, rapid disease progression, and mortality. Every child with HIV infection should be screened for micronutrient deficiencies and a nutritionist should be consulted. So, multivitamin and trace element supplements should be considered for all HIV infected children, with doses higher than the RDA, especially vitamin B2, B6, B12, A, C, and E [13]. Priestly et al reported that multivitamin supplementation of these children helps in stabilization of CD4 counts and improved survival [14]. Till now there are no studies available on incidence of scurvy.

The diagnosis of scurvy is largely made on clinical grounds [15] and may be supported by serum ascorbate levels of less than 11.4 micromol/L, or buffy-coat levels of lower than 1700 micromol/L. The serum values reflect metabolic turnover, while buffy-coat values represent tissue stores [16]. The serum ascorbate levels are specific but not sensitive, may be normal even in states of severe depletion. Better indicator of body stores is the measure of urinary excretion after parenteral ascorbic challenge test. In our patients, the serum ascorbate levels or urinary excretion could not be done, as these tests were not done in our place and also parents were not affordable. These children responded clinically and also radiologically within 2 weeks, after starting oral vitamin C administration.

Conclusion

Most of the HIV infected children may not present clinically with respiratory problems and or scorbutic features. Like hypertension, which is a silent killer, often undetected until too late. Radiographs are apparently non-invasive diagnostic tool that can be used to limit the spread or stem the scourge of this deadly disease. So, we recommend routine chest and knee x-ray, which could help in early diagnosis and timely treatment would help in increase in life expectancy of these children and micronutrient correction.

References

1. King LJ, Padley SPG. Imaging of the thorax in AIDS. *Imaging* 2002; 14: 60-76.
2. Mckerrow NH, Naidoo KL, Reddy R, Stephan CR. Step-by-step guide for the management of children on ART. 3rd ed. Durban: Department of Health: Kwazulu-Natal, February 2008.
3. Philip M. Imaging features of bacterial respiratory infections in AIDS. *Curr Opin Pulmed* 2004; 10(3): 163-188.
4. Salami AK. HIV/TB co-infection, pathogenesis, diagnosis and management in adults. *Afr J Clin Microbiol* 2006; 7(3): 161-174.
5. Peloquen C. TB in AIDS Patients. *Nat'l Jewish-Med. Sci.* 1994; 12: 1-10.
6. Salami AK, Oluboyo PO. Spectrum and prognostic significance of opportunistic diseases in HIV/AIDS patients in Ilorin, Nigeria. *West Afr J of Med* 2006; 25: 52-56.
7. Salami AK, Olatunji PO, Oluboyo PO, Akanbi AA, fawibi AE. Bacterial pneumonia in the AIDS patients. *West Afr J of Med* 2006; 25: 15.
8. Plessis V, Andronikou S, Struck G, Mckerrow NH, Stoker A. Baseline chest radiographic features of HIV infected children eligible for antiretroviral therapy. *S Afr Med J* 2011; 101(11):829-834.
9. Marks MJ, Haney PJ, McDermott MP, White CS, Vennos AD. Thoracic disease in children with AIDS. *Radiographics* 1996; 16: 1349-1362.
10. Owens CM, Allan R, Thomas K, Evans J, Stevens J. Pictorial review: the radiological spectrum of vertically-acquired HIV infection. *The Brit J Radiol* 1996; 69: 777-782.
11. Pitcher R, Goddad E, Hendricks M, Lawrenson J. chest radiographic pulmonaty changes reflecting extrapulmonary involvement in pediatric HIV disease. *Pediatric Radiology* 2009; 39: 565-568.
12. Paccou J, Viget N, Legroust-Gerot I, Yazdanpanah Y, Cortet B. Bone loss in patients with HIV infection. *Joint Bone Spine* 2009; 76(6): 637-641.
13. Baum MK, Shor-Posner G, Bonvehi P. Interim dietary recommendation to maintain adequate blood nutrient levels in early HIV-1 infection. *Eight Int Conf on AIDS.* Amsterdam, July 19-24, 1992.
14. Priestley J. Nutrient replacement therapy enhances survival and laboratory parameters of HIV positive patients. *Eight Int Conf on AIDS.* Amsterdam, July 19-24, 1992.
15. Behrman RE, Kliegman RM, Arvin A, Nelson W. Nutritional disorders. *Nelson Textbook of Pediatrics.* Philedelphia, Pa WB Saunders Co 1996; 178-179.
16. Wilson CW. Clinical pharmacological aspects of ascorbic acid. *Ann N Y Acad Sci* 1975; 258: 355-376.

Source of Support : Nil
Conflict of Interest : None Declared