RESEARCH BRIEF

Pericardial Effusion in Children: Experience from Tertiary Care Center in Northern India

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Received*: June 15, 2013;*
Initial review: August 01, 2013;
Accepted: November 27, 2013.

Objective: To describe profile and outcome in children with significant pericardial effusion. **Methods:** Hospital records of 25 children admitted with significant pericardial effusion during January 2010 to March 2013 were analyzed. **Results:** Thirteen (52%) children had tubercular, 6 (24%) had bacterial, 3 viral, 2 recurrent idiopathic and one had malignant pericardial effusion. Only 3 children in our series required surgical drainage. **Conclusions:** Echocardiography guided percutaneous pericardiocentesis and pigtail catheter placement was found to be safe and effective.

Keywords: *Echocardiography, Pericardium, Pericardiocentesis*

Pericardial effusion in children is caused by bacterial and viral infections, connective tissue disease, metabolic disorders and malignancies [1]. Echocardiography is an accurate and sensitive, bedside, non-invasive diagnostic tool [1,2]. Pericardial drainage can be achieved either by percutaneous catheter drainage or by surgery [3]. We report our experience with large pericardial effusions.

METHODS

Records of children admitted in pediatric department of Dr Ram Manohar Lohia Hospital, New Delhi, with significant pericardial effusion from January 2010 to March 2013 were retrospectively analyzed. Clinical findings and investigations, including electrocardiogram, chest *X*-ray and echocardiography findings were recorded. Cardiac tamponade was diagnosed by either : (*a*) paradoxical pulse of more than 12mm Hg, (*b*) poor peripheral perfusion and peripheral pulses with heart rate greater than 95th percentile for age, or *c*) systolic blood pressure <5th percentile for age with increase of systolic pressures and decrease of heart rate after pericardiocentesis [4].

Echocardiography was performed using Phillips 11HDXE machine. 'Significant pericardial effusion' was defined as echo-free space more than 1cm in front of the right/left ventricle, and pericardial tamponade was confirmed in the presence of right ventricular diastolic collapse [5].

Two-dimensional echocardiography guided pericardial puncture was performed in patients with tamponade. A 7 F cordis introducer sheath (Johnson and Johnson) was placed in the pericardial space over a soft tipped 0.038 Terumo (Terumo; Tokyo, Japan) guidewire. A multiholed soft 7 F pigtail catheter was advanced into the pericardial sac and the pericardial fluid was suctioned from the catheter tip into a reservoir. The catheter and sheaths were removed when echo showed almost complete emptying of the pericardial fluid with drainage volume decreased to less than 100 mL per day for more than 48 hrs. Surgical intervention was considered in thick organized pus not amenable to catheter drainage. Pericardial fluid was sent for Gram staining, Ziehl-Neelson (Z-N) staining, cytology, biochemistry, culture and sensitivity. Outcome was measured as hospital stay, mortality, constrictive pericarditis and recurrence. A descriptive analysis was done.

RESULTS

Twenty-five children (16 boys and 9 girls) were diagnosed to be having significant pericardial effusion during study period. Mean age was 8.1 years (range 2-17 yr). All children had tachycardia and tachypnea; fever, cough and chest pain was present in 23, 9 and 5 subjects, respectively. Jugular venous pressure was raised in nine children: two had pedal edema and nine had hepatomegaly. Distant heart sounds could be appreciated in 12 children; only one had pericardial rub. Chest roentgenography revealed cardiomegaly in 19 (76%) and bronchopneumonia in two children. Electrocardiography showed sinus tachycardia and low-voltage QRS complex in all the study subjects, and ST segment changes in 3 cases.

Echocardiography guided pericardiocentesis was done in 22 patients but pigtail catheter was placed only in nine.

Three children with failed pericardiocentesis required surgical drainage. There were no pericardiocentesis-related complications. Aspirate was exudative (pericardial fluid: serum protein ratio >0.5) in all the cases. Pericardiocentesis was not done in three children; one had echocardiographic evidence of myocarditis (dilated left ventricular cavity, global hypokinesia and ejection fraction of 48%) and the other two had disseminated tuberculosis. Thirteen effusions were considered tubercular based on clinical findings, positive Mantoux test , ADA, PCR or ZN stain. Six (23%) had pyogenic pericardial effusion; culture was positive in 4 cases [*Staphylococcus aureus :* 2 (blood) and 1(pus aspirated from thigh pyomyositis); *Pseudomonas aeruginosa:* 1 (pericardial fluid)]. No organism could be isolated in two cases with bronchopneumonia. Three had viral etiology; coxackie virus serology was positive in one. Two were labeled probable viral etiology after excluding other causes.

Two patients were labeled as having idiopathic recurrent pericardial effusion. One was a three-year-old boy with atrial septal defect and the other was a 12-year-girl, admitted 4 times with recurrent pericardial effusions, and died later with septic shock. One child had pericardial effusion associated with acute lymphoblastic leukemia; pericardial fluid cytology was positive for malignant cells.

Of the 9 children with tamponade, 3 were tubercular, 4 pyogenic, and 2 had idiopathic recurrent pericardial effusion. Appropriate treatment was administered in patients with tubercular and pyogenic effusions along with supportive treatment of congestive heart failure. Follow-up of these patients showed complete resolution of effusion in all except the one with recurrent pericardial effusion. None of them developed constrictive pericarditis over a median period of follow-up of 18 months (range: 2 to 28 months).

DISCUSSION

Tuberculosis (52%) was the most common etiological diagnosis in our series of pericardial effusion followed by bacterial (23%), viral (12%), recurrent idiopathic (8%) and malignant. All cases had congestive heart failure while 9 had cardiac tamponade. ECHO-guided percutaneous catheter drainage and pigtail catheter insertion was an effective and safe procedure for decompressing tamponade.

The study is limited by the fact that it reflects the profile in a tertiary care referral center and hence the results can not be generalized. Moreover diagnostic work-up for all viruses, and detailed immunological work-up was not done. Most children had received pre-referral antibiotics, possibly affecting bacteriological results.

Idiopathic effusions account for 20% to 40% of the cases in adults whereas they are rare in children [4-6]. With the advent of antibiotic therapy, there is decline in bacterial etiology and most frequent causes are presumed to be viruses in developed, and tuberculosis in developing countries [5,7]. Mok, *et al*. [8] and Roodpeyma, *et al*. [9] did not find any case of tubercular effusion in children. Guven, *et al*. [5] from Turkey reported tubercular etiology in 30% of their cases whereas we found it to be the most important etiology.

Purulent pericardial effusion is most often associated with infection at another site, with hematogeneous or direct spread to the pericardium [4,5]. The most common concomitant site involved is usually the lung. However, in our series bronchopneumonia was present in only two cases (33%) and no organism could be isolated. S. *aureus, H. influenzae,* and *S. pneumoniae* are the usual causative agents. We found *S. aureus* to be the most common agent for purulent pericardial effusion [10,11]. Viruses commonly causing acute pericarditis are Coxackie group B and Echovirus type 8 [9]. We could detect antibodies to coxackie virus in only one case. It is difficult to distinguish active viral pericarditis from idiopathic pericarditis; many cases of community acquired idiopathic pericarditis may be due to unrecognized viral infections [12]. Idiopathic effusions constituted 8% of our patients, which is similar to that reported by Zreik, *et al*. [4]. In adults it constitutes around 20 to 40% of pericardial effusions. [5,6,13].

Etiology from developed countries is quite different from the developing world where chest trauma, post-pericardiotomy syndrome, infections, immunological and idiopathic pericarditis predominate; tuberculosis was not reported in these series [4,8]. Immunological, traumatic and postsurgical pericardial effusions were not found in our study.

Echocardiography-guided pericardiocentesis has a well-established diagnostic and therapeutic role [14]. We also obtained reassuring results without any significant procedural complications. Constrictive pericarditis, a common complication of tubercular etiology, can be prevented by early diagnosis and institution of anti-tubercular treatment and steroids as in this study [8,15].

Acknowledgments: Dr NK Dubey, Head of the Department, Pediatrics, PGIMER and Dr RML Hospital, for infrastructural

WHAT THIS STUDY ADDS?

- Tuberculosis was the most common etiology for pericardial effusion in this study.
- Pericardiocentesis and pigtail catheter insertion were safe and effective procedures in children.

and administrative support, and Dr Sudha Chandelia for PICU support.

Contributors: DKY: conceived and designed the study and revised the article critically for important intellectual content. He will act as guarantor; NKB: helped in designing study, collected data ,analysed it and drafted the paper; TA: collection and analysis of data; SA: helped in data collection and statistical analysis; VG: revised the article for important intellectual content. The final manuscript was approved by all authors.

Funding: None; *Competing interests*: None stated.

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