

Cardiac tamponade in Ilesa, Nigeria

John Akintunde Okeniyi, BSc, MB ChB, FWACP (Paed)

Department of Paediatrics and Child Health, Wesley Guild Hospital, Ilesa/Obafemi Awolowo, University Ile-Ife, Osun State, Nigeria

Background. Cardiac tamponade in Nigerian children remains poorly researched.

Objective. To review the frequency, cause and outcome of cardiac tamponade at Wesley Guild Hospital, Ilesa, Nigeria.

Method. Retrospective audit of all children older than 1 month diagnosed with cardiac tamponade over a 7-year period (2001 - 2007) at the children's emergency room (CHER).

Results. Of the 8 813 CHER admissions, 16 (0.2%) children (11 boys and 5 girls) had cardiac tamponade. The most common causes were *Staphylococcus aureus* pericarditis (6 cases), blunt chest injury (4 cases) and tuberculous pericarditis (3 cases). The overall mortality rate was 62.5%. The case fatality rates were 100%, 66.7% and 33.3% for cardiac tamponade caused by trauma, tuberculosis and staphylococcal pericarditis, respectively.

Conclusion. Although rare, cardiac tamponade is a life-threatening emergency requiring prompt intervention to prevent death. The major cause is infective pericarditis. Large prospective studies would better estimate the disease burden and elucidate risk factors.

Cardiac tamponade is due to accumulation of fluid in the pericardial space, resulting in reduced ventricular filling and subsequent haemodynamic compromise.¹ The clinical features are elevated central venous pressure, hypotension and reduced heart sounds on auscultation (Beck's triad).² It may result from various causes including chest injury and iatrogenic complications.^{1,2} Non-traumatic causes are often infections such as bacterial and tuberculous pericarditis,³ in addition to diseases such as myocardial infarction, connective tissue diseases and uraemia.³ Although rare, cardiac tamponade is a potentially fatal paediatric emergency.⁴ Most studies have been published from First-World countries;⁵ neither pericarditis nor cardiac tamponade in children is well defined in developing countries.⁴ A study from Ibadan described only 3 cases of cardiac tamponade among 53 children with infective pericarditis over a 9-year period.⁶

The present study was conducted to determine the frequency, cause and outcome of acute cardiac tamponade in children at our institution.

Methods

A retrospective hospital-based audit was conducted at Wesley Guild Hospital, which serves children in Ilesa and the adjoining rural communities of south-western Nigeria. The children's emergency room (CHER) treats only post-neonatal-aged children (aged 1 month to 15 years); neonates are seen at a separate emergency unit. Hospital records of all children admitted to the CHER between 1 January 2001 and 31 December 2007 were retrieved and records of children in whom cardiac tamponade had been diagnosed either by physical examination or following investigations (including autopsy) were identified. Demographic details, diagnoses, investigations and outcome were documented and analysed using the Computer Programme for Epidemiologists (PEPI) software.

Results

Age, sex and aetiological distribution

During the selected period, a total of 8 813 children were admitted to the CHER, of whom 16 (0.2%), 11 boys (68.8%)

and 5 girls (31.2%), had a diagnosis of cardiac tamponade. Their ages ranged from 13 months to 12.5 years (mean (SD) 5.6 (3.1) years, with 7 aged under 5 years). The clinical features of the 16 cases are summarised in Table I. Nine children had infective pericarditis, caused by *Staphylococcus aureus* in 6 cases and by tuberculosis (TB) in 3. A child with chronic renal failure was admitted with uraemic pericarditis, and the cause was undetermined in 2 children. Non-traumatic causes accounted for 12 of the 16 cases. There was no significant difference in the mean ages of children with post-traumatic versus non-traumatic tamponade (5.0 (3.1) years v. 5.8 (3.2) years; $p=0.663$).

Post-traumatic cardiac tamponade secondary to blunt chest injury was diagnosed in 4 of the 16 cases. However, the diagnosis was delayed in the child with road traffic injury (case 2), in whom cardiomegaly was noted on a plain chest radiograph. The diagnoses in the 3 children who had fallen from multi-storey buildings (cases 3, 6 and 9) were missed clinically and made following post-mortem examination; 2 had aortic lacerations and another had myocardial rupture.

Special investigations

Diagnostic pericardial taps were conducted in 13 (81.3%) of the 16 cases (results are set out in Table II). Only 1 child tested positive for HIV (case 8, tuberculous pericarditis).

Plain chest radiographs were obtained in 13 cases and showed an enlarged globular cardiac silhouette in all 12 non-traumatic cases and in the child with a chest injury. A widened superior mediastinum was also noted in 2 of the 3 children with TB. Features of consolidation and pleural effusion were noted in cases 8 and 15.

Echocardiographs were done in only 5 of 13 cases due to lack of functioning equipment when the patients presented. These revealed marked pericardial effusion in all cases, with inferior vena cava dilation and left atrial diastolic collapse. Echogenic speckles were seen in 2 patients with tuberculous pericarditis while 1 had fibrinous epicardial strands.

Treatment

Of 4 children with traumatic cardiac tamponade only 1 had pericardiocentesis, but they all died (within 3 hours of hospital

TABLE I. CLINICAL SUMMARY OF THE 16 CHILDREN

| Case No. | Year | Age (yrs, mo.) | Sex | Cause | Associated illness | Diagnosis | Outcome |
|----------|------|----------------|-----|-------------------------------|-----------------------------|---------------------|----------|
| 1. | 2001 | 2, 2/12 | F | <i>S. aureus</i> pericarditis | Measles, septicaemia | Clinical, CXR | Survived |
| 2. | 2001 | 8, 4/12 | F | Road traffic injury | Head injury | Clinical, CXR | Died |
| 3. | 2002 | 6, 5/12 | M | Fall | Limb fracture | Autopsy | Died |
| 4. | 2002 | 4, 6/12 | M | <i>S. aureus</i> pericarditis | Pneumonia, pleural effusion | Clinical, CXR | Died |
| 5. | 2002 | 5, 3/12 | F | <i>S. aureus</i> pericarditis | Pyomyositis, septicaemia | Clinical, CXR | Survived |
| 6. | 2003 | 4, 3/12 | M | Fall | Multiple injuries | Autopsy | Died |
| 7. | 2003 | 5, 4/12 | M | <i>S. aureus</i> pericarditis | Pneumonia | Clinical, CXR | Survived |
| 8. | 2003 | 9, 6/12 | M | Tuberculous pericarditis | HIV/ AIDS | Clinical, CXR | Died |
| 9. | 2004 | 1, 1/12 | F | Fall | Multiple injuries | Autopsy | Died |
| 10. | 2004 | 3, 0/12 | M | <i>S. aureus</i> pericarditis | Underweight | Clinical, CXR, echo | Survived |
| 11. | 2005 | 2, 1/12 | M | <i>S. aureus</i> pericarditis | Measles, septicaemia | Clinical, CXR | Died |
| 12. | 2005 | 8, 1/12 | F | Uraemia | Chronic renal failure | Clinical, CXR | Died |
| 13. | 2006 | 6, 4/12 | M | Undetermined | Sickle cell anaemia | Clinical, CXR, echo | Survived |
| 14. | 2006 | 8, 2/12 | M | Tuberculous pericarditis | Underweight, septicaemia | Clinical, CXR, echo | Died |
| 15. | 2006 | 12, 6/12 | M | Tuberculous pericarditis | Nil | Clinical, CXR, echo | Survived |
| 16. | 2007 | 3, 2/12 | M | Undetermined | Nil | Clinical, CXR, echo | Died |

CXR = chest radiograph; echo = echocardiogram.

arrival). The treatment of 12 non-traumatic cases included pericardiocentesis. Three children required further pericardial tube drainage (cases 5, 14 and 15). Overall, resolution was achieved in 6 (50%) non-traumatic cases. Hospital stay ranged from 2 hours to 32 days (mean (SD) for trauma cases 3.0 (1.0) hours and for non-traumatic cases 12.1 (9.5) days).

An 8-year-old boy with TB pericarditis and staphylococcal septicaemia (case 14) died after 28 days in hospital in spite of being on continuous sub-xiphoid tube drainage. Serial echocardiography revealed progressive pericardial constriction with multiple loculations, and he might have benefited from surgical pericardiectomy which was not available at the hospital. The child with chronic renal failure (case 12) did not have dialysis.

Outcome

A total of 1 063 (12.1%) CHER admissions ended in death of the patient; 10 (0.9%) were cases of cardiac tamponade. The mortality rate following cardiac tamponade among under-5s was higher than that for older children, but not significantly so (5/7 v. 5/9; $p=0.896$). All children with traumatic and uraemic disease died, and mortality rates for the other disease categories were 66.7% for tuberculous pericarditis and 33.3% for *S. aureus* pericarditis. In addition, 1 child with tamponade of undetermined aetiology died. The mortality rate for all cases of cardiac tamponade was 62.5% (100% for traumatic v. 50.0% for non-traumatic tamponade).

Discussion

The male preponderance observed was similar to that in a previous report.³ In this study the prevalence of cardiac

tamponade was less than 1% of childhood emergencies, with between 1 and 3 patients per year presenting to the unit. However, retrospective studies do not reliably estimate disease frequency and there is a need for well-designed prospective studies.⁴

Infective pericarditis was the major cause of cardiac tamponade in our patients, which is consistent with the high incidence of staphylococcal sepsis in the tropics and among Nigerian children,^{6,8} as the latter infection can also be complicated by pericarditis.⁸ Although the worldwide frequency of purulent pericarditis is reported to be declining, immunocompromised patients, for example with HIV/AIDS or malignancies or undergoing chemotherapy, remain significantly at risk.^{7,9}

TB is common among children, and TB-HIV co-infection is becoming a major problem among children in Nigeria.¹⁰ One of the 3 children who developed cardiac tamponade following TB pericarditis was HIV positive, but it should be noted that

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TABLE II. INVESTIGATIONS, TREATMENT AND OUTCOME IN 12 CHILDREN WITH NON-TRAUMATIC CARDIAC TAMPONADE

| Symptoms | <i>S. aureus</i> pericarditis (N=6) | Tuberculous pericarditis (N=3) | Uraemia (N=1) | Undetermined (N=2) |
|--------------------------|-------------------------------------|---|---------------|---------------------------|
| Pericardial aspirate (N) | | | | |
| Appearance | Purulent (6) | Serous + fibrin clots (2) Sero-sanguineous (1) | Serous | Serous (2) |
| Microscopy/culture | <i>S. aureus</i> (6) | AAFB (3) | Nil | Nil |
| Blood culture (N) | | | | |
| Isolate | <i>S. aureus</i> (6) | <i>S. aureus</i> (1) | Nil | Nil |
| Treatment (N) | | | | |
| Pericardiocentesis | 6 | 3 | 1 | 2 |
| Sub-xiphoid tube drain | 1 | 2 | - | - |
| Blood transfusion | 4 | 1 | - | - |
| Steroids | - | 3 | - | 2 |
| Antibiotics | Cefuroxime, gentamicin | Anti-TB (including strepto- mycin) | Cefuroxime | Cefuroxime, gentamicin |
| Outcome (N) | | | | |
| Resolution | 3 | 2 | - | 1 |
| Recurrence | 1/ 3 | 1/ 3 | - | 1 |
| Days in hospital | Mean 14.6 (SD 3.7) | Mean 22.7 (SD 13.3) | 2 | 6, 3 |
| Survived | 4 | 1 | - | 1 |

AAFB = acid- and alcohol-fast bacilli.

not all children were tested. Tuberculous pericarditis is the most common cause of pericardial effusions in some provinces of South Africa, where the burden of TB confounded by HIV co-infection is also steadily increasing.^{1,5}

Consistent with published data, this study suggests that, although rare, cardiac tamponade is a life-threatening emergency that requires prompt intervention to prevent death.¹¹ A high index of suspicion, with early chest radiography and echocardiography and prompt therapy, could enable many more children to survive. Pericardiocentesis may be lifesaving,^{1,4,7} and should ideally be available in emergency rooms. However, it has also been suggested that partial pericardiectomy and sub-xiphoid tube drainage may be superior to pericardiocentesis in the management of pyopericardium.¹² Large prospective studies are needed in order to estimate the burden of disease, elucidate risk factors and investigate effective treatments for cardiac tamponade in children.

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