Heart failure in the paediatric age group

Victor Grech MD, PhD (Lond), PhD (Malta), FRCPCH, MRCP(UK), DCH

Consultant Paediatrician (Cardiol)
Associate Professor of Paediatrics, University of Malta
Editor-in-Chief, Images Paediatr Cardiol **www.impaedcard.com**
Editor, Malta Medical **Journal www.um.edu.mt/umms/mmj**
Email: victor.e.grech@gov.mt

Educational aims

- To have a better understanding of heart failure in children
- To be familiar with the main causes of heart failure in children
- To be updated on the treatment of heart failure in this age group

Key words

Heart failure, Diuretic, Child, Heart Failure/therapy, Angiotensin-Converting Enzyme Inhibitors, Preschool, Cardiac Surgical Procedures, Infant.

Abstract

Heart failure is uncommon in childhood but its recognition is naturally important. Causes vary, but the commonest are congenital heart disease as well as infections/cardiomyopathy. The main presentation is shortness of breath on exertion and in babies, this may manifest as the inability to complete a feed, along with an elevated respiratory rate. The most commonly used drugs are diuretics, and angiotensin converting enzyme inhibitors, as well as calorific supplementation. The vast majority of patients with heart failure are infants with congenital heart disease and fortunately, treatment for these patients is excellent with very high survival rates.

Introduction

The main presentation is shortness of breath on exertion. In babies, this may manifest as the inability to complete a feed, along with an elevated respiratory rate.[4]

Congenital heart failure

Congenital heart disease leading to heart failure in infancy is usually due to a left to right shunt inside the heart. This may be caused by a hole between the two ventricles (ventricular septal defect - VSD), or a persistently patent arterial duct between the aorta and the pulmonary artery (patent ductus arteriousus – PDA). Since the pressures on the left side (all chambers: atria, ventricles and aorta) exceed those on the right side, blood shunts from left to right, flooding the lungs with an excessive volume of blood, hence the breathlessness. Even at rest, these individuals have a high respiratory rate. Lower limb oedema is not relevant and not found in this age group.

Because of the physiological way in which pressure in the lungs fall after birth, large shunts manifest as above, in heart failure, at about six weeks of age. Treatment of heart failure is usually surgical, at this age, but medications are very useful in these babies to stabilize and relieve symptoms until then.[5]

Management

Heart failure is initially treated with a diuretic to decrease preload by promoting natriuresis, and to provide relief of volume overload symptoms such as pulmonary and peripheral oedema. Loop diuretics are used first, usually furosemide. Bumetanide is a more potent diuretic and is usually reserved for more severe or furosemide-resistant fluid overload. Furosemide is generally supplemented with spironolactone, an aldosterone antagonist which reduces urinary potassium loss, making it particularly suitable for use in conjunction with furosemide. In children up to 12 years, furosemide is usually prescribed in syrup form at a dose of 0.5 - 2 mg, 12 -hourly or 8-hourly, depending on the patient's age. Spironolactone, is generally prescribed, also in syrup form at a dose of 1 - 2 mg /kg/ day in neonates and up to 3 mg/kg/day in infants and children up to 12 years; the daily dose is given in 1 - 2 divided doses.[6]

If this is insufficient to control heart failure, such that, for example, the baby is

not thriving well due to the shortness of breath, an angiotensin converting enzyme inhibitor is added to the treatment. Captopril is usually the drug of choice and this is generally combined with the loop diuretic alone.[7]

Additional helpful treatment includes calorific supplementation of feeds and if feeds cannot be taken, babies can be helped by nasogastric tube feeding. Naturally, once surgery is over, all medications are tailed off. A pharmacological issue that often arises is that some of these medications may not be imported and may be therefore need to be extemporaneously prepared by the hospital pharmacy.[6]

Heart failure in older children

Children may also present in heart failure acutely at an older age, and the commonest cause is viral myocarditis. For example, presentation may be a few days after a coryzal illness. Treatment is as outlined above but the only medication which improves long term prognosis is an angiotensin converting enzyme inhibitor. If not tolerated, e.g. if a dry persistent cough develops, an angiotensin receptor blocker may be used. A third of these children recover completely and their medications are stopped. A third recover partially and may remain on an angiotensin converting enzyme inhibitor. A third will never recover at all, developing dilated cardiomyopathy, and may remain on treatment until organ replacement is arranged. This assumes they survive the disease and its complications until a donor is found.[8]

A rarer presentation is that of de-novo dilated cardiomyopathy which may be familial. Treatment is also as outlined above.[9]

Conclusion

All in all, the vast majority of patients with heart failure are infants with congenital heart disease and fortunately, treatment for these patients is available and is excellent with very high survival rates.[1]

Key points

- Heart failure is uncommon in childhood but recognition is important.
- Commonest causes are congenital heart disease and cardiomyopathy.
- Presentation is tachypnoea and shortness of breath on exertion and poor feeding in babies.
- The most commonly used drugs are diuretics and angiotensin converting enzyme inhibitors.
- Calorific supplementation and nasogastric tube feeding may also be required.

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