Acute heart failure

The prevalence of heart failure is increasing due to an ageing population and success in delaying coronary events through primary and secondary prevention. New-onset or acute chronic decompensation resulting in hospitalisation represents a significant and growing healthcare burden. Major precipitants of admission in the elderly include: dyspnoea, fluid retention, non-compliance with medication or indeed an ischaemic event. Regardless of the underlying cause, the immediate goals are to improve symptoms and stabilise the patient. This article outlines the current available evidence to support the management of acute heart failure in the elderly.

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Heart failure affects around 15 million Europeans[1] and the prevalence in the UK is estimated at around 707,000.[2] The prevalence rises sharply at around 75 years of age, so the prevalence in 70–80-year-old people is between 10 and 20%,[3] making heart failure a common clinical problem for us in geriatric medicine. Despite its prevalence, research efforts over the last 15 years have focused primarily on chronic heart failure and data describing clinical characteristics and outcomes for patients with acute heart failure, particularly in the elderly population, have been lacking.[4] Studies that have been undertaken report under-utilisation of treatments known to benefit younger patients and a failure to adequately assess cardiac function.[5]

Acute heart failure has been defined as "a change in heart failure signs and symptoms resulting in the need for urgent therapy".[6] The term acute heart failure encompasses numerous syndromes differing in pathophysiology and clinical phenotype. The European Society of Cardiology (ESC) attempted to classify these syndromes, shown in Box 1.[6] Clearly, there is a great deal of overlap between these categories and it can be very difficult to distinguish between them in the clinical setting. Management of acute heart failure is challenging given the heterogeneity of the patient population, absence of a universally accepted definition, incomplete understanding of the pathophysiology and lack of robust, evidence-based guidelines.[2] Major precipitants of admission include: congestion, uncontrolled hypertension, arrhythmias, non-compliance with medication and, indeed, an ischaemic event. The immediate goals are to improve symptoms and stabilise the haemodynamic condition. Most patients have rapid symptomatic improvement with loop diuretics and a relatively short hospital stay.[6] There are, of course, the patients who don't respond to standard medical therapy or who, because of cardiogenic shock, are unsuitable for it due to worsening hypotension, and may need consideration for more aggressive treatment. This article outlines current available evidence to support the management of acute heart failure in the elderly.

Box 1: ESC classification of acute heart failure syndromes

- Acute decompensated heart failure (de novo or decompensated chronic heart failure)
- Hypertensive acute heart failure
- Pulmonary oedema
- Cardiogenic shock
- High output failure

Risk stratification

Clearly, the ability to accurately assess prognosis in acute heart failure would allow us as clinicians to triage patients to appropriate

Box 2: Poor prognostic factors in acute heart failure

- Advanced age
- Ischaemic aetiology
- Low left ventricular ejection fraction
- Systolic hypotension
- Raised troponin
- Raised creatinine

levels of therapy. Unlike acute coronary syndromes where several systems have been developed, there are no well established clinical methods of risk stratification for patients admitted with acute heart failure although various predictive factors have been proposed in the literature.[4,7–11] The models all worked on the basis of identifying easily accessible data present on admission that can be used to predict mortality. Applied in the clinical setting, such assessments in theory should be able to identify high-risk patients who either warrant early referral to critical care settings or indeed palliative care. Poor prognostic indicators are shown in Box 2. A recent prospective study of 324 patients over the age of 65 years admitted with acute decompensated heart failure demonstrated that female gender and worse New York Heart Association class were independent predictors of a longer length of stay.[12]

Treatment

Diuretic therapy and intravenous nitrates

Although loop diuretics are used in nearly all patients with acute heart failure to relieve congestive symptoms, optimal dosing strategies remain poorly defined.[13] A recent prospective, randomised, parallel-group study compared the effectiveness of continuous intravenous with intermittent intravenous infusion of furosemide in 56 patients with acute decompensated heart failure. The group receiving the continuous infusion had a better diuresis and shorter length of stay than those receiving intermittent infusion. A Cochrane review in 2005 concluded that, based on small and relatively heterogenous studies, continuous infusion was more effective than intermittent infusion, but trials involving greater numbers were required for a more definitive opinion.[14]

Intravenous nitrates can be used to produce rapid symptomatic relief through a mechanism involving nitric oxide and cyclic guanosine monophosphate (GMP), which induce arterial and venous vasodilation. Although relatively safe, nitroglycerin can result in hypotension and its dose should be titrated according to blood pressure and clinical response. Due to changes in the heart and blood vessels with age, plasma half-life of nitrates is longer and volume of distribution is larger in older people. This is probably why nitrate-induced severe hypotension is more frequent in elderly patients; initial dosages of nitrates should be as low as possible.[15]

Non-invasive ventilation

Until recently, those patients with acute heart failure who did not respond to conventional treatment were endotracheally intubated and ventilated. The primary objective of non-invasive ventilation (NIV) is avoiding intubation and subsequently reducing mortality.[16] There are two main modalities of NIV: continuous positive airway pressure (CPAP) and bi-level positive airway pressure (BIPAP). There are several unproven theories as to why non-invasive ventilation should benefit patients with acute heart failure.[17]

- Positive pressure improves oxygenation by increasing the numbers of expanded alveoli
- Increased intra-alveolar pressure physically drives fluid into capillaries across alveolar membranes
- The work of breathing is decreased
- Increased intrathoracic pressure decreases venous return and cardiac filling pressures.

Three recent systematic reviews have looked at randomised, controlled trials comparing conventional therapy with NIV.[18–20] These systematic reviews demonstrated a clear reduction in the risk of intubation with NIV, compared with conventional therapy, and a tendency for NIV to reduce mortality (see Table 1).

However, conflicting results emerged in 2008 from the landmark UK trial The Three Interventions in Cardiogenic Pulmonary Oedema (3CPO), which randomised patients presenting with severe pulmonary oedema to: standard oxygen therapy, CPAP or BIPAP.[21] A total of 1069 patients (mean age±SD: 77·7±9·7 yrs; female=56·9%) were recruited from 26 emergency departments in the UK between July 2003 and April 2007. All patients received assigned treatment for a minimum of 2 hours. The study showed no significant difference in mortality rates between patients receiving NIV and those receiving standard oxygen therapy, although NIV was

associated with greater reductions in dyspnoea, heart rate, acidosis and hypercapnia, compared with standard oxygen therapy.

The discrepancy between the outcomes of the meta-analyses and systematic reviews versus the 3CPO trial may be explained by differences in the patient populations as patients in the 3CPO trial were older, predominantly female and had severe pulmonary oedema. The individual trials analysed by the meta-analyses and systematic reviews comprised small numbers, which limits the generalisability of their findings. The C3PO trial used an intention-to-treat analysis, which means that patients whose treatment was switched from that in their initially assigned group were considered "treatment failures". The exclusion of these patients will clearly have impacted on the results.

Inotropic support

Positive inotropic agents such as dobutamine have been used in the treatment of patients with low-output heart failure for a number of years.[22] All too often, inotropes can be started without a clear management plan in place, and their adverse effects must not be forgotten. It is generally agreed that they are best used as a bridging therapy prior to definitive treatment, such as coronary revascularisation, but this is often not considered or indeed feasible in the elderly population. Treatment goals should be clearly identified prior to starting treatment along with early discussion with the cardiologists.

Unfortunately, there remains insufficient data on the efficacy and safety of these agents in the management of acute heart failure, and most of the literature is based on American studies using agents we don't commonly use in the UK. The inotropic agent most commonly used in the setting of acute heart failure in this country is dobutamine. Dobutamine is a direct-acting positive inotropic agent that stimulates the β-adrenergic receptors in the heart. Acute stimulation of contractility increases cardiac output and subsequently the perfusion of organs and tissues. Given its mode of action, dobutamine is associated with the following adverse effects:[4]

- Increased risk of arrhythmias
- Increased myocardial oxygen consumption
- Increased heart rate

Although concern has been expressed about the potential aggravation of ischaemia by inotropic agents in the setting of infarction, critical hypotension itself can further compromise myocardial perfusion and, therefore, in this setting it is generally assumed that the benefits of haemodynamic improvement can outweigh its risks.[23]

Treatment in the community

Advances in heart failure treatments may have prolonged survival but more patients die of heart failure than of any type of cancer.[24] A large study in the US (median age=85 yrs) comparing a cohort of cancer patients (n=7565) with one of heart failure patients (n=5836) showed that use of acute care services in the 30 days before death was higher amongst the heart failure group (64% vs 39%), and that more heart failure than cancer patients died during acute hospitalisations (39% vs 21%).[24]

A small US study investigated whether it was feasible to treat elderly patients with acute decompensation at home.[25] Patients were randomised to either the general medical ward (n=53) or the Geriatric Home Hospitalisation Service (GHHS; n=48). There was no significant difference in mortality rates or number of subsequent hospital admissions between the two groups but patients assigned to the GHHS demonstrated improvements in depression, nutritional status and quality of life scores.

A similar study, undertaken between 2002 and 2006, examined the feasibility of outpatient intravenous diuretic therapy in patients with acute decompensation.[26] This showed that 72% (n=107) of patients stabilised without admission, and no patients required hospitalisation for hypotension.

Nevertheless, given the heterogeneity of patients with heart failure, clearly some subgroups would be unsuitable for home treatment. For example, patients with new onset heart failure, a lack of social support or no telephone connection at home, and those that need assisted ventilation or intensive monitoring are usually cared for in hospital.

Patients at high risk of complications may also be better suited to inpatient care. However, provided that the appropriate patients are selected, outpatient management of acute decompensation clearly has potential to reduce current hospital dependency.

Conclusions

Management of acute heart failure is challenging due, in part, to the heterogeneity of the patient population and lack of a single definition. Hospital admission for acute decompensated heart failure in the elderly population remains a significant healthcare burden and clear evidence-based guidelines are lacking. Realistic treatment goals should be established early following a collaborative discussion with: the patient's family, cardiology team, intensive care team and of course the patient where appropriate.

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