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An Audit of Urgent Echocardiograms and an Analysis of Parental Understanding of a Normal Echocardiographic Study in a Regional Centre in Malta

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Abstract

Introduction: Echocardiography is the modality of choice for investigation of suspected congenital or acquired heart disease. It may be used as part of the screening process for suspected heart disease in childhood after the incidental finding of a murmur, even if this is deemed to be an innocent murmur by the referring clinician. However some studies have shown that parents may misunderstand the implications of a normal test and may persistently restrict their child's activity even after a normal echocardiogram. The second part of this study prospectively audited echocardiography requests for non-elective (urgent) echocardiograms, in the setting of a regional hospital that serves an entire captive island population for the period 2007. An analysis of parental understanding of a normal echocardiogram was also carried out.

Methods: All normal and all urgent echocardiograms were prospectively collected for the 2007 Parents were administered a telephone questionnaire with regard to their understanding of a normal echocardiogram, after one month. Information collected also included age of patient, delay from request to actual procedure, actual indication and echocardiographic outcome (diagnosis).

Results: 88 non-elective echocardiograms were performed with a bimodal age distribution ranging from 1 hour to 50 years. The majority were infants. 6 patients were aged over 14 years. The delay to the actual performance of the echocardiogram ranged from 2 hours to 20 days, with a mean of 2.8 days and a median of 1 day. The outcome was completely normal in 35 individuals, physiological for age in 14 individuals (total normal of 49 - 55%) and abnormal in 39.

89 normal echocardiograms were included. 79 parents stated that they were fully satisfied with the explanation and implications of a normal echocardiogram and 10 were almost fully satisfied. No significant differences could be found between these two groups. A hard copy was more likely to reassure the parents, but not at a statistically significant level. Only 77 had a full explanation with regard to the implications of an innocent murmur with echocardiographic confirmation but this too did not affect parental reassurance.

Discussion: 88 non-elective echocardiograms accounted for 10% of the total paediatric echocardiogram referrals for the period 2007, with a significant pick-up rate for pathological lesions.

For normal echocardiography examinations, this study confirms that parents are satisfied with an explanation of the implications of a normal echocardiogram. Our service can be improved by providing a full explanation to all parents and by adopting the policy of giving a hard copy of the normal report to all parents.

Introduction

Innocent murmurs are extremely common in childhood [1] and clinicians must use discretion in referring children with murmurs for assessment and possibly echocardiography, as such referrals further burden already strained health systems and generate parental disquiet [2,3].

While cardiology referral itself may cause severe parental anxiety [4] several studies have shown that parents may have an incomplete understanding of the reason for such referral, the actual echocardiogram itself (even if normal) and the implication of a normal echocardiographic examination [4].

Echocardiography is also the modality of choice for investigation of suspected congenital heart disease. This imaging modality is also used to screen for acquired heart disease, often in association with other conditions, such as Kawasaki disease in the paediatric age group [5].

Echocardiogram requests may be divided into three types: critical (for example, a cyanosed newborn), early appointments (next session) and purely elective (next available slot).

This study prospectively analysed two facets of paediatric echocardiography: 1. An audit of requests for the first two groups as above, that is, non-elective (urgent) echocardiograms, in the setting of a regional hospital that serves an entire captive island population [6]. 2. This study also prospectively analysed the degree of parental understanding of a normal echocardiogram.

Methods

Audit of urgent echocardiography referrals

Data from all individuals referred for echocardiogram to the only

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regional hospital in Malta (Mater Dei Hospital) for a non-elective echocardiogram was prospectively collected in a spreadsheet. Echocardiograms were performed by one of three local paediatric echocardiographers (VG, MB or VM). Information collected included age of patient, delay from request to actual procedure, actual indication and echocardiographic outcome (diagnosis).

An echocardiogram that was physiological for age was defined as one with the findings of a patent oval foramen, an insignificant and silent arterial duct and flow acceleration in the branch pulmonary arteries without pulmonary stenosis, all in the neonatal period.

Parental understanding of a normal echocardiographic exam

All children (up to14 years of age) referred for echocardiogram to the only regional hospital in Malta (Mater Dei Hospital) with the diagnosis of a 'murmur' and who had a normal heart, were called home and the parents given a telephone questionnaire one month after the echocardiographic study by one staff nurse (DJ) who was not personally known to the parents. Data was collected in a spreadsheet and parents were also asked about who had actually performed the study (one of three local echocardiographers), whether an explanation as to the likely innocent nature of the murmur was given by the referring doctor or by the paediatrician who reviewed the child at hospital prior to echocardiography, whether a copy of the echocardiogram report was given to the parents, whether a full explanation was given after the echocardiogram and the implications (e.g. no need for exercise restriction) and whether an explanation was given as to the likelihood that a functional murmur is louder during an intercurrent febrile episode and that this may lead to a general practitioner 'rediscovering' a murmur.

The following were excluded in the early neonatal period albeit physiological at the time of the echocardiogram, since a repeat echocardiogram was scheduled in order to confirm normality at 6-12 months of age: patent oval foramen /small atrial septal defects, small patent arterial ducts, hypertrophic cardiomyopathy in the setting of impaired glucose tolerance or frank maternal diabetes and mild branch pulmonary artery flow acceleration.

Parental understanding of the normal nature of the echocardiogram and therefore of a normal heart, was graded on a scale of 1 to 5, by the parents themselves. Data was compared using 2-tailed chi tests. A p value of less than or equal to 0.05 was taken to indicate a statistically significant result.

Results

Audit of urgent echocardiography referrals

A total of 88 non-elective echocardiograms were performed over the period 2007. These were done at one of two locations: on the neonatal paediatric intensive care unit using a portable echocardiography machine and at Cardiac Lab where patients were well enough to be moved there.

Minimum age at echocardiography was 1 hour and maximum age was 50 years. There were a total of 6 patients aged over 14 years of age. The latter were all were cases of grown up congenital heart disease and for this reason, the referral was to the paediatric echocardiography service. The overall age distribution is shown in Figure 1. The majority were infants.

The indication for non-elective echocardiogram is shown in Table 1. The majority were for murmurs. The delay to the actual performance of the echocardiogram ranged from 2 hours to 20 days, with a mean of 2.8 days (standard deviation 3.5 days) and a median of 1 day.

The outcome was completely normal in 35 individuals, physiological for age in 14 individuals (total normal of 49 - 55%) and abnormal in 39.

Parental understanding of a normal echocardiographic exam

A total of 89 echocardiograms were included for the period 2007. 79 parents stated that they were fully satisfied with the explanation and implications (score 5) and 10 were almost fully satisfied (score 4).

No significant differences were found in the above scores when the data was analysed with regard to which echocardiographer performed the investigation. 79 (89%) had had an explanation by the referring doctor. There was no correlation between this datum and the outcome score. Similarly, there was no correlation between score and an explanation given by the hospital paediatrician prior to echocardiography (77 in all, 87%).

73 parents (82%) were given hard copies of their child's normal echocardiogram report while 16 (18%) were not. Scores were higher in those given a report, with 92% having scored 5 of those given a report while 75% scored 5 in those not given a report. However, this was not a statistically significant result ($p=0.075$).

Discussion

Audit of urgent echocardiography referrals

The paediatric echocardiography waiting list for elective echocardiography in Malta is around 2 months and a total of 861 echocardiograms were performed by the three local paediatric echocardiographers for the period 2007. The 88 non-elective echocardiograms in this study accounted for 10% of the total.

Acute echocardiography requests continue to increase worldwide with increasing availability of this imaging modality [7]. Even in

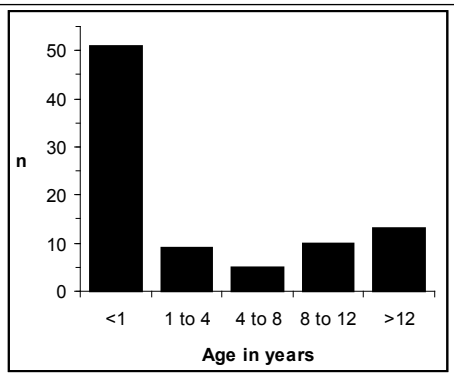

Figure 1: Age distribution of non-elective echocardiograms.

Indication	n
Murmur	53
Kawasaki disease	7
Screening- associated congenital anomaly	4
Palpitations	3
Prior to chemotherapy	3
Cyanotic spells	2
Other	16

Table 1: Indication for non-elective echocardiogram.

units were access to echocardiography is meant to be governed by specific guidelines, the adherence to such guidelines was found to poor irrespective of the seniority of the referring physican.[8] For this reason, in adult cardiology practice, it has been recommended that in view of limited resources, hospitals should vigorously screen referrals for open access echocardiography [9].

On the other hand, earlier diagnosis and intervention may be crucial in severe congenital heart disease as lesions may be life threatening and earlier diagnosis is associated with increased survival [10]. Indeed, clinical studies show that portable echocardiography can be safely used to initiate and modify treatment. Indeed, the sensitivity of portable echocardiography for the detection of cardiac lesions is higher than that of clinical examination and reaches 70-90% compared with conventional echocardiography [11].

This study demonstrates the wide variety of ages and lesions which present for urgent echocardiography. The oldest patient in this study was a 50 year old patient who had had tetralogy of Fallot repaired in childhood and who presented in right heart failure due to progressively increasing right ventricular outflow tract obstruction.

Our age group shows a bimodal distribution with an expected neonatal peak and a second peak commencing from 8 years of age due to complaints such as muscular chest pains and palpitations around the commencement of puberty, most of which turn out to be normal on investigations which may also include electrocardiography. Moreover, this end of the distribution also includes individuals with grown up congenital heart disease who present with new problems or complications of earlier interventions, as shown in the above example.

It is important to note that babies who have echocardiography performed very early on in life will have physiological anomalies detected, such as a patent oval foramen, a patent arterial duct or pulmonary branch stenosis [12]. These babies will almost inevitably have to have a repeat echocardiogram in order to confirm that the lesion has resolved and it is our policy to perform this investigation at 6 months of age. There may be an argument for delaying echocardiograms until such babies are at least a few days old, particularly in babies where such investigations are performed solely for screening purposes such as in individuals with congenital anomalies or syndromic babies. The commonest such syndrome in Malta is Down's syndrome since the Roman Catholic law that pertains to Malta makes termination of pregnancy, for whatever reason, illegal and hence syndromes (particularly trisomies) are not routinely screened for [13]. This naturally precludes babies in whom there is a clinical suspicion of structural heart disease, with, for example, desaturation, an atypical murmur or other abnormal clinical findings. It is clear from this study that in Malta, as in other countries wherein echocardiography facilities exist, many unnecessary echocardiograms are carried out despite the limited availability of facilities.

Parental understanding of a normal echocardiographic exam

Echocardiography may be deemed unnecessary in the setting of a murmur that is deemed 'innocent' by a paediatric cardiologist [14]. Nevertheless, these investigations are often done routinely as part of the assessment and/or the expectations of the parent/s or the referring physician [15].

However, incomplete parental understanding of an innocent murmur in the setting of a normal heart often leads parents to falsely believe that their child has a heart problem [4]. Such misperceptions may lead to morbidity in that parents may restrict their children's physical activities [16].

Various studies have evinced conflicting results as to the degree of parental understanding in this regard. Some have shown that the diagnosis of an innocent murmur, reinforced by an investigation, such as an echocardiogram and that further verbal reassurance leads to better parental understanding and to children thereafter being treated normally [17]. Others have shown that the assumption that an explanation of the tests performed (and their normality) may be insufficient to promote a clear perception of normality and cite personal and social factors as obstacles [18].

Out study confirms the former in that parents are satisfied with an explanation of the implications of a normal echocardiogram. However, this study does demonstrate potential areas for improvement in our service. Firstly, a substantial proportion of parents were not told that by the hospital paediatrician that the child's murmur was likely to be innocent and the implications of a normal echocardiogram. While this did not correlate with parental satisfaction and an explanation by the echocardiographer appears to have sufficed, on general principles, a full explanation that the parents are likely to remember is an important conclusion to an outpatient appointment. Secondly, our study suggest that a tangible, hard copy of a normal echocardiogram report is more reassuring to the parents and this policy will be adopted by our department. We are also considering reinforcing the explanation of a murmur in the setting of an echocardiographically normal heart by creating a specific parent handout.

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