Congenital Heart Surgery Nomenclature and Database Project: Palliation, Correction, or Repair?
Cassandra Joffe, MD, and Robert M. Sade, MD
Department of Surgery, Medical University of South Carolina, Charleston, South Carolina

Background. Inconsistent use of the terms palliation, repair, and correction fosters unclear thinking about the goals of cardiac operation. Actual usage of these terms has not been previously documented.

Methods. Every article, for two years, pertaining to congenital heart surgery in The Annals of Thoracic Surgery and The Journal of Thoracic and Cardiovascular Surgery was systematically inspected for terms of classification.

Results. In the 301 articles reviewed, repair and correction were used virtually interchangeably. Palliation was generally used distinctively, but all 3 descriptors were used for 3 operations. The etymology of each descriptive term suggests that they have distinct traditional definitions and connotations. Repair suggests returning to normal that which was once normal, while correction carries no implication of prior normality; thus, correction is the more etymologically correct term for congenital heart operations. In current literature, palliation is used improperly for a few operations to denote lack of anatomic correction or lack of permanence of correction.

Conclusions. Because proper usage reflects both etymology and actual usage, we suggest that repair and correction may be used interchangeably. Palliation, however, should describe only operations that are not intended to provide normal cardiac physiology.

Operations for congenital heart disease may be classified as palliative, reparative, or corrective. Yet, this taxonomy may not be entirely clear because several procedures seem to fall on both sides of their boundary lines. Clarification of the defining characteristics of these terms is not merely an exercise in semantics. Language is necessary for accurate communication, and the meaning of words is a central feature of language. Words have commonly understood meanings, with connotations clarified by context. A word used imprecisely cannot accurately convey the intended message; thus, language can obfuscate rather than clarify thought [1]. The words palliation, repair, and correction are used to classify operations with respect to the goals of treatment: some procedures are intended to result in normal function of the heart, and some are intended merely to relieve a symptom of the heart disease. The terms themselves, therefore, can convey to the listener or reader an understanding of the intent of the surgeon.

A debate among lexicographers, which is centuries old, revolves around the question of whether definitions should be descriptive, based on how words are used, or prescriptive, based on some standard of how words should be used [2]. We suggest that both approaches play a role in asoing accurate transmission of information. Description of current word usage is needed to create a context in which traditional rules and original meanings can sharpen general understanding of the intended message.

A description of current usage of language used to classify treatment goals of congenital heart surgery could provide the basis for sharpening blurred classification. To this end, we have reviewed the recent surgical literature on the treatment of congenital heart disease to discover exactly how the terms palliation, repair, and correction are used. We will describe the results of this survey, then examine the etymology of the terms, and, finally, recommend appropriate usage.

Material and Methods
We read in detail every article pertaining to congenital heart disease published in The Annals of Thoracic Surgery and The Journal of Thoracic and Cardiovascular Surgery from January 1997 to January 1999, including appended discussions, editorials, and letters to the editor. We systematically recorded every mention of any form of the words palliate, repair, and correct, along with the malformation and the operation being discussed. Pertinent contextual information was noted, as were other descriptive terms, such as curative. Operations were grouped into types according to specific malformation. For example, different techniques for correction of Fallot's tetralogy were considered one type of procedure. Other examples of operative types were atrial septal defect closure, including both suture and patch closure, and Fontan procedure, including all operations for single ventricle that resulted in Fontan physiology. We used no statistical methods of analysis for this survey.

0003-4975/00/$20.00
PII 50003-4975(99)01253-9
Results

We reviewed 301 articles (including editorials and letters) on congenital heart disease, originating from five continents and from several different medical and surgical disciplines. Although no statistical method was applied, we did not recognize cultural or disciplinary trends of word usage. We were able to identify 49 types of operative procedures.

A form of the word repair was used to describe operations in 213 articles (71%); palliation in 87 (29%); and correct in 40 (13%). Fifty-seven (19%) did not use any of the terms. The total differs from 100% because several papers used more than one term for the same operation.

Within each category, the number of operative types were: palliation, 14, repair, 40, and correction, 24. Several operative types appeared in only one category. Some procedures were uniformly referred to as palliation: cavopulmonary and atrio pulm onary anastomoses (n = 7), systemic-to-pulmonary artery shunts (n = 22), and pulmonary arterial banding (n = 15). Operations appearing only in the correction category included ablative procedures for atrial arrhythmias (catheterization or maze techniques; n = 2), anomalous hepatic artery redirection (n = 1), and dynamic cardiomyoplasty (n = 1). Operations appearing only in the repair category were aorticopulmonary window closure (n = 2), the Konno-Rastan operation (n = 3), modified Bentall's procedure (n = 1), and heart transplantation (n = 1).

Several operative types appeared in more than one class. The largest of these groups comprised procedures described as both corrective and reparative (n = 20), occasionally in the same journal article. Congenital heart operations referred to as both reparative and corrective include:

- Anomalous coronary artery reimplantation
- Anomalous pulmonary venous return redirection
  (partial or total)
- Anomalous systemic venous return redirection
- Aorta-to-left atrium fistula closure
- Aortic anuloplasty for prolapsing right coronary cusp
- Aortoplasty for supravalvar aortic stenosis
- Atrial septal defect closure
- Atrioventricular septal defect closure
- Atrioventricular canal reconstruction
- Coarctation procedure
- Coronary sinus defect closure
- Fontan procedure
- Interrupted aortic arch reconstruction
- Jatene procedure
- Pulmonary artery unifocalization
- Rastelli procedure
- Sinus of Valsalva plication for dilation
- Tetralogy of Fallot reconstruction
- Truncus arteriosus reconstruction
- Ventricular septal defect closure

A few operative types were described as both palliative and reparative (n = 10):

- Bidirectional cavopulmonary anastomosis
- Coarctation procedure
- Damus-Kaye-Stansel procedure
- Fontan procedure
- Jatene procedure
- Norwood procedure
- Patent ductus arteriosus interruption
- Ross procedure
- Right ventricle-to-pulmonary artery conduit
- Tricuspid valve reconstruction in Ebstein's malformation

Of the 23 operative types in the correction category, all but 3 also appeared in the repair class. Three operative types appeared in all 3 classes:

- Coarctation procedure
- Fontan procedure
- Jatene procedure

Comment

This survey provides a description of how the terms palliation, repair, and correction are used in the contemporary pediatric cardiac surgical literature to categorize operations. Repair and correction seem to be used nearly interchangeably; in fact, nearly all operative types in the correction category also appeared in the repair category.

Palliation seems sharply distinguished from the other two terms; most palliative procedures appeared exclusively in that category. Even so, there were several examples of overlap with the terms repair and correction. Therefore, the taxonomy in question seems insufficiently clear to transmit ideas regarding the goals of operative procedures accurately. Against the background of the descriptive data we have generated, we will examine the etymology of the 3 terms, hoping to discern their best use.

The word palliate stems from the Latin palliare (to cloak). In medicine, it is usually taken to mean the masking or lessening of an effect; for example, the treatment of pain and depression in a patient with incurable cancer is called palliation. Therefore, a palliative operation may, most reasonably, be taken to mean one that provides symptomatic relief, but leaves the main pathophysiology uncorrected.

The word repair stems from the Latin reparare (to put back in good order), probably introduced into the English language from the French reparer (to restore to a previous state). Throughout its usage in English literature, there has always been the implication of a prior sound state: "to restore to good condition by renewal or replacement of decayed or damaged parts" (Oxford English Dictionary). In surgery, therefore, a reparative operation is one which restores to normal that which was once normal. We repair a ruptured aorta, we repair a stab wound of the right ventricle.

The word correct stems from the Latin corrigere (to make straight, set right, reform, amend). Among the many distinct definitions of this term, 2 pertain to health: "to bring into a healthy or normal state," and "to coun-
teract or neutralize to remove or prevent ill effect” (Oxford English Dictionary). In six centuries of usage, there has never been an implication of a previously well condition, in contrast with repair. Thus, a corrective operation attempts to make normal that which was never normal. Congenital heart malformations comprise anatomic and physiologic abnormalities that never were normal, so correction is the term most appropriate for operations designed to return heart function to normal.

The meaning of ‘normal’ is not unambiguous and must be specified in this context. In the broad field of biology, the term describes structure or function that is typical of the species and is capable of supporting life [3]. In considering operation for congenital heart disease, however, it is clear that we apply the term to function rather than structure. For example, we would not consider surgical intervention for a normally functioning aortic arch in which the four branches arose from a single branch trunk from the aorta (bovine arch). We would, on the other hand, operate to reposition an anomalously originating innominate artery if it were compressing the trachea. As a consequence, both a Senning operation and a Jatene operation should be said to correct transposition of the great arteries, even though the Senning leaves the ventricles transposed relative to the great arteries.

Outstanding pediatric cardiac surgeons have criticized using correction to describe congenital heart operations. Dobell is concerned that the use of so strong a word produces a complacent state of mind in surgeons [4]. Now, however, 25 years after he wrote, there surely are few pediatric cardiac surgeons who have residual illusions about the permanence of the corrective operations we undertake. A more plausible criticism is that the results of most congenital heart operations are not known to be durable. Dobell takes correction of a congenital heart defect to mean normal hemodynamics, conductance, myocardial function, size, and perfusion. Stark has characterized a corrective operation as one in which normal function is achieved and maintained, life expectancy is normal, and no further medical or surgical treatment is necessary [5]. Both surgeons observe that long-term results over a lifetime are unknown or, at best, uncertain; thus, we can claim to correct few heart malformations.

We believe that both surgeons ask too much of the term correction. Its origin and use in other contexts carries no connotation or implication of a requirement for long-term durability. We are merely human, and lack the foresight to predict which of our patients will do well and which will suffer a complication or early failure of the intended result. We can retrospectively determine probabilities of one outcome or another, but we cannot know what will happen to any given patient after we operate. So we are left with no knowledge of what the outcome of an operation for a particular patient will be, only with the certainty of what we intend the outcome should be. It is interesting that we noted no mention of the word cure in the literature we reviewed. This is the word surgeons usually use to indicate that a problem has been corrected with little or no likelihood of recurrence or complications, as when we speak of curative resection of a cancer. It seems likely that most pediatric cardiac surgeons recognize the uncertainty of long-term outcomes of most operations they perform by refraining from describing them as curative, using instead the terms corrective or reparative.

The data we have reported show broad areas of agreement about how to classify various kinds of operations for congenital heart disease. There is, however, clear evidence of conceptual fuzziness of the lines separating palliation, repair, and correction. Given the many complex features of a congenital heart, physiology, and operative outcomes associated with these lesions, it is unlikely that sharp, bright lines of demarcation between these classes can be constructed. Nevertheless, we can communicate our ideas more accurately by using a clearer taxonomy of congenital heart operations. The discussion above suggests how we might be able to accomplish this.

Labeling heart operations as palliative seems unproblematic, for the most part. Palliative procedures are those which mitigate symptoms or extend life without addressing the basic pathophysiology, such as pulmonary artery band and aortopulmonary shunt. Among the 10 operations that were described as both palliative and reparative, only 2 can be accurately classified as palliative: Norwood procedures, which leave the patient with an aortopulmonary shunt as the source of pulmonary blood flow, and bidirectional cavopulmonary anastomosis, which does not directly address the main pathophysiology. The remaining 8 procedures should be characterized as palliative only if major associated malformations remain uncorrected.

The two components of possible understandings of correction, which have confounded discussions of its usage, are durability and anatomy. As noted above, an operation may be corrective even if it does not last a lifetime, and even if it does not restore normal anatomy. Intention to produce normal or nearly normal function is the defining characteristic of corrective operations. The functional problems requiring surgical intervention for congenital heart disease are: inappropriate quantities of oxygenated and unoxygenated blood flowing to the pulmonary and systemic capillary beds (eg, intracardiac shunts), inappropriate volume loads, (eg, left-to-right shunt and valve insufficiency,) and increased pressure loads (eg, intracardiac, valvar, and vascular obstructions) on the heart and blood vessels. Operations should be considered to be corrective if they are intended to completely or nearly completely: (1) separate the greater and lesser circulations; (2) restore adequate quantities of appropriately oxygenated blood to each capillary bed; and (3) reduce volume and pressure loads toward normal levels. Thus, the 8 procedures described as both palliative and reparative (listed in the Results section) that are not palliative are corrective, because, irrespective of anatomical abnormalities or long-term durability, they are intended to produce normal or nearly normal physiology.

The terms repair and correct seem to be used nearly interchangeably in the pediatric cardiac surgery litera-
nature. Nearly all the operation types that were found more than once or twice appeared on both lists. The two terms are etymologically distinct, however, based on preexistence of a normal condition. A repair sets right an abnormality that was previously normal, while a correction sets right an abnormality that was not previously normal. Congenital heart malformations, by this definition, cannot be repaired, but can be corrected. The etymological distinction between these two terms is clear; repair should not be used to describe congenital heart operations intended to produce normal physiology. The proper term is correction. There can be little question, however, that repair is often used to describe correction of congenital malformations in contemporary medical usage. Plastic surgeons speak of repairing cleft palates, and urologists speak of repairing extrophied bladders. Because of this widespread common usage and despite etymologic evidence to the contrary, we believe it appropriate to use both correction and repair to describe corrective operations for congenital heart malformations.

The most difficult to classify of all operation types are the Fontan procedures. They are not palliative because they do not merely provide symptomatic relief; they are intended to bring adequate amounts of appropriately oxygenated blood to all capillary beds. Because they often fail to achieve this goal fully and are notably outside normal anatomical bounds (such hearts have no right-sided ventricle), some surgeons believe corrective is too strong a term to describe them, so inappropriately classify them as palliative. We believe the proper classification of these operations is correction, however. First, anatomic issues are not relevant to operative classification. Second, the intent of Fontan procedures is to produce normal or nearly normal perfusion with appropriately oxygenated blood; they satisfy all three criteria for correction cited above. The level of correction falls short of entirely normal physiology, so we have suggested the modifier orthotermal correction for such procedures [6].

Our final comment regards the word cure. This is the term that implies normal postoperative function and life span, free from adverse sequelae of disease. At this time, there are few if any congenital heart operations that deserve this strong a descriptor, because there is insufficient evidence to justify it. It is our hope one day to add cure to the taxonomy for the goals of congenital heart operations.

References