Definition of ischaemia

Sir; – I recently moved from a major medical school (State University of New York at Buffalo), where the majority of my time was spent performing laboratory research on myocardial ischaemia, to accept a position at St Olaf College, an undergraduate liberal arts college where I spend much more time teaching physiology to undergraduate students. As such, I have become acutely aware how the language of “experts” affects students who are learning a subject for the first time.

This semester, I am teaching a cardiovascular physiology class to upper level biology and/or chemistry majors. Our class is small (14 students), and we spend the majority of each class session discussing various aspects of the cardiovascular system. We began the semester talking about the heart and, to delve into the myocardial ischaemia area, we recently read your editorial, “Myocardial ischaemia: can we agree on a definition for the 21st century.” After reading the article, I asked each student to write a “letter to the editor” describing their own reaction to the editorial and how they, after reading the opinions of the “experts”, would define myocardial ischaemia. So that you and others may appreciate the insights of those just learning the language of cardia physiology, I would like to share some of the responses with you.

Based on the array of definitions in the editorial and our subsequent class discussion, all students recognised that a blood flow disturbance and some associated energy supply:demand deficit are central to the definition of myocardial ischaemia. Along these lines, most students appreciated the “short and sweet” definitions. One student says, “I found the simplest definitions the easiest to understand. For example, ‘blood supply inadequate to meet the needs of the heart’ is very clear and does not contain information unrelated to the definition of ischaemia, information which tends to cloud the definition itself” (Abi Watras).

Most student definitions followed similar short and sweet approaches, such as “ischaemia is in a broad sense the inability of enough oxygenated blood to supply a tissue” (Erik Julsrud) or “reduced flow of normally oxygenated blood to the tissues of the heart” (J Matthew Fay). As two students (John Elvecroeg, John Berge) pointed out, there was very little dispute of the shortest of all definitions, “supply:demand imbalance”.

There was a strong sentiment that many of the definitions got bogged down with unimportant technicalities. For one student these discussions reminded her of the basic axiom that, “when scientists don’t know what something is they give it a name” (Debra Mumm). One student asks, “why is it so important to put an exact definition to this obviously confusing topic?” (Krista Murzelfeldt). Another student commented, “the more I read the various definitions the more I realised how far science is from coming up with a proper definition” (Bill Kelly). One student compared the problem to trying to view the contents of a multiple holed birdhouse through a single hole; everyone sees the contents through the perspective of the hole they are looking through. If the roof of the birdhouse were lifted off, “a more complete and accurate view of the birdhouse could be seen” (Resha Eriksmoen).

I found it interesting that despite the students’ recognition that the contributors approached their definitions from their own perspective, each of the students, after only one session discussing the topic, had their own perspective as well. Most students favoured definitions that included some mention of the multiple consequences of ischaemia. For example, Jennifer Sevig suggested that ischaemia, “results in a chain of events (biochemical, electrical, functional, etc) that are normally harmful to the heart.” However, one student felt that “it is more desirable to define ischaemia in terms of its metabolic underpinnings, because as researchers continue to investigate this phenomenon, they might find ischaemia to be present in cases not previously considered to be ischaemia from a simple heart functioning viewpoint” (Alex Menter).

After contemplating upwards of 40 definitions of myocardial ischaemia, Kristen Bothun remarked, “sometimes when I think of ischaemia, I feel like tearing down the Hoover Dam and allowing the liquid to flow freely.” Cristine Reiling, the only student in the class with previous laboratory experience with myocardial ischaemia, was transformed from a practical view of myocardial ischaemia similar to that of Rudolf Virchow (the consequence of restricting blood flow) to agreement with Richard Bing in his invited commentary that “definitions ossify the truth while at the same time obscure it.” Finally, one of our members (Rahil Baxamusa) was so moved by our discussions of myocardial ischaemia that he suggested a rewrite of the famous balcony scene in Romeo and Juliet:

Ischämia, ischämia, whatfor art thou ischämia?
Deny thy heart
and refuse thee oxygen,
and if thou shalt do what I just asked, the heart shall no longer be fully functional.

In closing, I would like to thank you for providing the framework for such a stimulating and enlightening discussion. Due in large part to your editorial, I believe that 14 bright and energetic undergraduate students can now talk myocardial ischaemia with the “experts”.

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