A recurring task in the work of a clinical cardiologist is to quantify the degree of mitral regurgitation in patients with valvular incompetence. Its relevance in establishing surgical indications\(^1,2\) and providing a prognosis for patients with several types of cardiovascular disease\(^3,4\) makes the attempt to improve the measurement of regurgitant flow in these patients essential. Several clinical signs and invasive/noninvasive methods have recently been used to this end.\(^5\)

The introduction of Doppler color flow mapping several years ago enabled the visualization of cardiac flow. The different types of flow found in the cardiac cavities—normal anterograde flow, shunting, and regurgitant jets—have different characteristics. From this perspective, studying regurgitant jets has obvious diagnostic and prognostic relevance. However, hopes that it would be relatively simple to measure regurgitant lesions\(^6\) with this technique soon proved false. All the methods used to measure the severity of valvular regurgitation by measuring the jet or attempts at reconstructing the jet from several planes have proven difficult.\(^7\)

It is now clear that the appearance of turbulent jets depends on factors different from regurgitant flow, while the influence of instrument settings, driving pressure and so-called wall jets is well known.\(^8\) From the point of view of hydrodynamics they have intrinsically different magnitudes because the regurgitant jet includes extra fluid belonging to the receptor chamber and the amount depends on the driving pressure for a given regurgitant volume.

In any case, the clinical use of semiquantitative measurements of regurgitant flow—which enable analyzing the jet, even by simple visual estimation—is undeniably useful and can be validly compared to far more refined methods.\(^9,10\) Thus, it continues to be the most commonly used method in our setting, not only for the rapid measurement of valvular regurgitation, but also for prognosis by using both the measurement of the jet’s dimensions and the visual estimation mentioned, where the operator combines a series of already known data into the evaluation process.

On the other hand, theoretical work on fluid behavior and the need for a quantitative approach (more comprehensive and reliable measurements) have led to the study of two new methods for measuring regurgitant flow: momentum analysis and flow convergence.\(^11,12\) Both techniques enable calculating maximum flow, regurgitant flow/beat, and regurgitant flow. It must be mentioned again that, in all these cases, the calculations not only reflect the severity of valvular regurgitation, but also the patient’s current hemodynamic situation, which can vary.

Momentum is the physical parameter that provides the best description of jet patterns.\(^6^\) Two methods have been used to calculate this. The first\(^8\) uses the property of dynamic similarity of the jet. This method involves intrinsic difficulties in practice, the first of which, breathing, can be overcome; second, there is the phenomenon of intrinsic flows that impinge on the measurement area; and, third, there are also practical difficulties involved in aligning the Doppler beam with the central jet, which is hindered by cardiac motion and turbulence. The calculation of \(U_m\) (central velocity of the jet) seems even more difficult to solve and, in the case of wall jets—which are involved in a considerable number of patients—early transfer of momentum before it is fully developed makes it unquantifiable.

The second method for quantifying momentum—where the information on velocity coded in the pixels has a proportional weight, in contrast to the binary...
this affects the outcome and would require a change in

distorted base is encountered rather than a flat surface;
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accepted that convergent flow area is barely affected
morphology of the isovelocity lines. Although it is
marginal strata that can distort the hemispherical
finite viscosity that can lead to the formation of
Another problem that should be borne in mind is that,

independently of the hemodynamic situation. This
valve lesion can be calculated relatively
in the series of hemispherical isolines with a progressively
smaller surface and progressively greater velocity. In
these circumstances, and by applying the principle of
conservation of mass, the instantaneous flow
through the orifice can be calculated as the product
of the velocity of one of these isolines multiplied by
its surface area. Based on this, the concept of
regurgitant orifice was introduced in the 1990s
from which, similar to what occurred regarding
valvular stenosis, the magnitude of the regurgitant
valve lesion can be calculated relatively
independently of the hemodynamic situation. This
interesting idea has clear clinical and surgical
implications and continues to be of undeniable
conceptual value, leading to useful contributions and
new approaches to calculation and follow-up. Its
measurement is simple and has excellent correlation
with the regurgitation fraction, both in the mitral and
tricuspid valves, and is also demonstrably more
stable than volume measurements regarding clinical
follow-up.

However, there are problems inherent to the method
for calculating the regurgitant orifice, for example, the
local geometry of the valve, which in many cases, is
different from the shape described by the theory of
convergent flow. In this context, a surface with a
distorted base is encountered rather than a flat surface;
this affects the outcome and would require a change in
the constant 2π in order to describe the surface angle.
Another problem that should be borne in mind is that,
in the original theoretical models, viscosity was not
taken into account; however, we know that blood has
a finite viscosity that can lead to the formation of
marginal strata that can distort the hemispherical
morphology of the isovelocity lines. Although it is
accepted that convergent flow area is barely affected
by the echocardiography device settings, if we
compare it with the turbulent regurgitation area, a
distorting effect has been reported leading to using a
low impulse repetition rate that tends to underestimate
the calculated flow. Currently, it is also known that
lowering the aliasing line of the high frequency wall
filters makes the low velocities of the coded map
disappear and overestimates the velocities represented
on the map. Even so, and after assessing all these
factors—some of which are compensated for when
obtaining the result—it has been proven that the
method works successfully when compared with the
other methods available.

Moya et al have broad and successful experience
in the study and use of the proximal acceleration
method applied to mitral valve regurgitation. In this
issue of the REVISTA ESPAÑOLA DE CARDIOLOGÍA, they
address an aspect that possibly leads to this type of
analysis being underused in clinical practice, i.e., it
is thought to be difficult to perform. Although most
Doppler ultrasound equipment includes the software
needed to simply and rapidly calculate flow, many
echocardiography specialists have been slow to adopt
this, thus hindering the widespread use we consider it
deserves. Thus, the authors, leaving aside its intrinsic
quantitative potential, have used it semiquantitatively,
proved its clinical usefulness and reliability and, in
addition (which makes it especially interesting),
obtained considerable time savings. As they mention,
their method fulfills the recommendations of the
European and American cardiology societies.

Efforts such as those made by Moya et al are
welcome and should be supported by this method
becoming more widely used. It has effectively proven
its worth in all the theoretical and practical tests it has
been submitted to, although it has not yet achieved the
popular success it deserves.

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