A Double-Needle Technic for Transbronchial Left Heart Catheterization

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CONTINUING progress in the surgical management of rheumatic mitral vascular disease makes accurate preoperative appraisal of mitral valvular function mandatory. Left heart catheterization studies have therefore become essential in many cases. Unlike the posterior transthoracic approach to the left side of the heart, transbronchial left heart catheterization has been limited to a single-needle technic. Although Colvez et al. have described a single-needle method for recording simultaneous left atrial and ventricular pressure pulses, we have felt that if a second needle could be safely introduced into the left atrium by the transbronchial route, more accurate as well as additional studies could be obtained. This has led to a modification of the standard Morrow transbronchial needle and a modification of the technic of transbronchial left heart catheterization which is described.

Description of Needle and Technic

The original Morrow needle has been modified by attaching 6 metal guides to the left side of the shaft (fig. 1). An accessory 18-gage thin-walled needle, 55 cm. long, is inserted through these guides. The guides were constructed so that the accessory needle and the Morrow needle are parallel but 4 mm. apart at their distal ends. The entire assembly passes easily through a standard 8-mm. Broyles bronchoscope. The depth to which the accessory needle is inserted into the left atrium is limited to the same depth as the Morrow needle by a needle stop that impinges against the bronchoscope.

Initially a polyvinyl catheter is placed in the ascending aorta by means of percutaneous, retrograde catheterization of the right brachial artery. The Morrow needle is then passed transbronchially into the left atrium with the accessory needle in the withdrawn position. After left atrial pressure has been recorded, a polyethylene or polyvinyl catheter is passed into the left ventricle through the Morrow needle. Once satisfactory positioning of this catheter is obtained, the accessory needle is inserted into the left atrium, being automatically directed by the metal guides. Simultaneous atrial, ventricular, and central aortic pressure pulses are recorded. The blue-dye test for mitral insufficiency as described by Fisher is then performed. Upon withdrawal of the catheter from the ventricle to the atrium for completion of the blue-dye test a pull-through is recorded (fig. 2). Finally both needles are removed and the tracheobronchial tree is thoroughly aspirated of blood. The average time of endoscopy is 30 minutes. Cardiac output is determined by catheterization of the pulmonary artery and utilization of the Fick principle.

Results

Twenty left heart catheterizations have been performed by this technic without complications. The second needle was easily inserted into the left atrium in every instance. The amount of bronchial bleeding encountered has not been excessive.

Discussion

The transbronchial technic of left heart catheterization has been shown to be a safe and reliable procedure. This method of studying function of the mitral valve has usually been limited to recordings through a single lumen with sequential pressure tracings across the valve. To avoid the inconvenience of later superimposition of these pressure pulse tracings and to determine more accurately the left ventricular filling gradient in the presence of stenotic lesions, simultaneous tracings are necessary.

Modification of the Morrow needle now permits simultaneous placement of 2 needles into the left atrium. The second needle is not inserted until the left ventricle has been successfully catheterized. Simultaneous and equisensitive left ventricular and left atrial pressure pulses may then be obtained and superimposed by means of a photographic

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Double-Needle Technic

Figure 1
A. Disassembled view showing the 18-gage, thin-wall, accessory needle, 55 cm. long, with needle-stop attached near the hub, and the modified Morrow needle with attached metal guides. B. Enlarged view of metal guide attached to Morrow needle. C. Morrow needle and accessory needle assembled. The accessory needle has been advanced to the same depth as the Morrow needle. D. Two needles within a standard 8-mm. Broyles bronchoscope. The needle-stop is shown impinging against the edge of the bronchoscope.

Figure 2
Simultaneous left ventricular and left atrial pressures. The ventricular pressure is recorded from a polyethylene catheter passed through the Morrow needle, while the atrial pressure is recorded from the accessory atrial needle. Withdrawal of the catheter across the mitral valve reveals the accurate conformity of the catheter and needle recordings.
recorder. This permits more accurate measurement of a ventricular filling gradient and calculation of valve area from a modification of Gorlin's original hydraulic formulae.\(^5\)

In evaluating mixed mitral valvular lesions it is desirable to supplement pressure studies with a dye test for mitral insufficiency, which can be performed in the average laboratory. The complexities of instrumentation, recording, and interpretation make widespread utilization of the various radioisotope and peripheral arterial dye-dilution technics impractical at the present time. The Fisher blue-dye method for assessing the severity of mitral insufficiency is simple, however, and is easily adaptable to the 2-needle technic described. Although one may question the validity of this test primarily on the basis of the adequacy of atrial mixing, from a practical standpoint it has aided materially in selection of patients for surgery.

The freedom from complications in this series, coupled with the experience of others\(^3\) in multiple punctures of the left atrium, makes us believe that this is a safe and useful procedure.

Conclusions

The Morrow needle for transbronchial left heart catheterization has been modified to permit the insertion of 2 needles into the left atrium. A safe and reliable 2-needle technic for transbronchial left heart catheterization is described. Since this permits simultaneous left ventricular and left atrial pressure pulse recordings and performance of blue-dye studies by Fisher's technic, a more accurate and complete appraisal of mitral valvular function is possible. This technic has been applied in 20 consecutive left heart catheterizations without complication.

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Summario in Interlingua

Le agulia de Morrow pro catheterismo sinistro-cardine transbronchial esseva modificata de maniera a render possibile le introduction de 2 agulias in le atrio sinistre. Un salve e fidit technica a 2 agulias pro catheterismo sinistro-cardine transbronchial es describite. Proque isto permette le simultanea registrazion de pulsos de pression sinistro-ventricular e sinistro-atrial con le effectuation de studios a tincuration blau secundo le technica de Fisher, un plus accurate e complete evaluation del function del valvula mitral deveni possibile. Iste technica esseva applicate in 20 consecutive catheterisationes sinistro-cardine sin ulla complication.

References


Thus we are men, and we know not how: there is something in us that can be without us, and will be after us; though it is strange that it hath no history what it was before us, nor cannot tell how it entered in us.—Sir Thomas Browne, Religio Medici. Edited by W. A. Greenhill, M.D. London, MacMillan and Co., Ltd., 1950, p. 60.
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