Hypothesis and Experiment

A research problem is not solved by apparatus, it is solved in a man's head. . . . The laboratory is the means by which it is possible to do the solving after the man has the idea clarified in mind.—CHARLES F. KETTERING.
or intravenous pyelogram, bilateral ureteral catheterization should be performed to establish the functional significance of the arterial lesion.

Summary

The reliability of the radioisotope renogram in detecting functional disparity in the separate kidneys of hypertensive patients with unilateral renal disease was investigated. Renograms recorded in 33 hypertensive patients without unilateral renal disease were employed for establishing control criteria. The physiologic basis for the three types of positive renograms found in the presence of unilateral renal dysfunction has been discussed. The renogram appears to be a valuable method for demonstrating significant disparity in separate kidney function while avoiding the hazards and technical difficulties of bilateral ureteral catheterization.

References


Origin of Knowledge

Nourished by knowledge patiently won, bounded and conditioned by co-ordinate reason, the imagination becomes the prime mover of scientific discovery.—John Tyndall.
cessive gene. Sex-linked dominance can be ruled out, since an affected father transmitted the trait to sons. An autosomal dominant trait should appear equally in males and females and, in this family, the ratio of affected males to affected females is 4:4. Also, an autosomal dominant trait should be transmitted to 50 per cent of the offspring of an affected parent. Since III-9 produced a child with the trait, one must assume that she had the dominant gene but did not develop clinically detectable signs of the trait. With this assumption, the observed data (eight with the dominant gene) fit the expected number (nine) quite well. The data support the hypothesis that, in this family, congenital cardiac conduction defects are transmitted as an autosomal dominant trait with an incomplete but high degree of penetrance.

Summary

A family in which several members of three separate generations have evidence of congenital familial conduction disturbance has been described. The occurrence of Adams-Stokes seizures with congenital AV block was also noted. From the available information it is clear that the conduction disturbance was congenital in two generations, and the family history suggests that three or four generations were probably involved. The data suggest that in this family the congenital cardiac conduction defects were transmitted as an autosomal dominant trait with incomplete penetrance.

References


The Legacy of Greece

With the fall of the Roman Empire practically all of Greek science was lost to the West, although much of it survived in the Byzantine Empire. Recovery was slow: it came first from the Arab world by way of reconquered Spain, along with the significant contributions of Arab medicine. Arabic translations of Galen and Hippocrates and the Canon of Avicenna were translated in turn into Latin by Gerard of Cremona. Another source was the School of Salerno in southern Italy, a way station for the Crusaders, and the place where the Arab scholar Constantine of Africa established himself in the eleventh century.—André Cournand, M.D. Circulation of the Blood. Edited by Alfred P. Fishman, M.D., and Dickinson W. Richards, M.D. New York, Oxford University Press, 1964, p. 17.


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Arteries, Veins, and the Movement of Blood

In the treatise On the localities of man [Hippocratic Congress—Fifth Century B.C.], one finds the first mention of these connections, as well as a suggestion that blood circulates.

"The vessels communicate with one another and the blood flows from one to another. I do not know where the commencement is to be found, for in a circle you can find neither commencement nor end, but from the heart the arteries take their origin and through the vessel, the blood is distributed to all the body, to which it gives warmth and life; they are the sources of human nature and are like rivers that purl through the body and supply the human body with life; the heart and the vessels are perpetually moving, and we may compare the movement of the blood with courses of rivers returning to their sources after a passage through numerous channels.—André Cournand, M.D. Circulation of the Blood. Edited by Alfred P. Fishman, M.D., and Dickinson W. Richards, M.D. New York, Oxford University Press, 1964, p. 5."
SURGERY OF SUBVALVULAR AORTIC STENOSIS

patient is at rest. Operation is recommended for those patients with this disease who are experiencing significant and limiting symptoms related to obstruction of the left ventricular outflow tract.

Acknowledgment

Doctors F. H. Ellis, Jr. and D. C. McGoon kindly consented to inclusion in this study of patients operated on by them. The authors wish to acknowledge the cooperation of Captain F. L. Giknis and Dr. E. Grey Dimond in providing the findings obtained during postoperative cardiac catheterization and angiocardiography of one of the patients reported on in this paper.

References


How Medicine Became a Science

Discoveries of the greatest value to medicine were made in the first half of the nineteenth century. In France Berthollet and Berzelius and in England Humphrey Davy followed in the clinical footsteps of Lavoisier, discovered new elements and laid a firm foundation for modern inorganic chemistry. Davy was ahead of his time in putting forward the view that electrical and chemical phenomena might be different manifestations of the same power. The advance of chemistry and its use in medicine was of such importance that when, in 1815, a medical curriculum had to be laid down consequent on the passing of the Apothecaries Act, a course of lectures on chemistry was made compulsory. An epoch-making experiment was made in 1828 when Wöhler heated ammonium cyanate and found that urea had been formed. This formation of urea was the beginning of the applications of synthetic chemistry to the organic compounds of the body. More directly connected with surgery was the discovery by Davy of the anaesthetic properties of nitrous oxide early in the century. Davy frequently inhaled gallons of the gas and described his relief from pain when suffering from inflammation of the gums; he needed only to have gone a little further to have been the originator of anaesthesia. It was in the fifth decade of the century that anaesthesia suddenly became practicable. Sulphuric ether had been known for centuries but it was not till 1846 that its anaesthetic properties were so clearly demonstrated at the Massachusetts General Hospital that it sprang into use almost at once all over the civilized world. This discovery stimulated others to try the properties of other substances and everyone knows the dramatic experience of Simpson and his friends which led to the discovery of the anaesthetic effects of chloroform, which, incidentally, had only been isolated sixteen years previously. Chemistry was proving its worth to medicine.—Zachary Cope, KT. Some Famous General Practitioners and other Medical Historical Essays. London, Pitman Medical Publishing Co., Ltd., 1961, p. 190.
countershock who were not receiving digitals or in whom digitalis had been discontinued for several days failed to show these electrocardiographic abnormalities. The results indicate that digitalis intoxication will often appear following conversion to sinus rhythm when no indication of digitalis intoxication was present prior to conversion. It is recommended that digitalis be withheld for several days in subjects for whom a conversion attempt is planned.

References


The Quest for Meanings

It is my conviction that no limit should be set on the intellectual content of scientific research. In our quest for meanings we should look for a unifying tradition, for a continuity of ideas evolved by great men, for their grasp of and their addition to what their predecessors knew, and also for the large schemes that are sometimes elaborated. In such an endeavor, we must be familiar with and apply a method that is scientific in its spirit of inquiry based on checking, confronting, even doubting what appears certain to others, and historical in the sense that predominant periods and large syntheses must be identified, and that creative men must not be separated from their surroundings, or from the prevailing ideas and events of their time.—André Courand, M.D. Circulation of the Blood. Edited by Alfred P. Fishman, M.D., and Dickinson W. Richards, New York, Oxford University Press, 1964, p. 3.


Galen on the Movement of Blood

Galen did not clearly state whether the blood, once it passed into the pulmonary veins, was transmitted to the left ventricle. ... Galen held that inspired air in some form or other, or some quality derived from air, was transferred from the lung through the venous artery into the left cavity of the heart by means of the diastolic active dilatation of the ventricle, and that there was a movement of waste products in the opposite direction, from left ventricle to the lung through which they were expired. "The venous artery (pulmonary vein) has no advantage of being closed since it has rather the mission of letting pass from the heart into the lungs the sooty residues which the natural heat necessarily produces in that organ (the heart) and which have no shorter means of exit. This discharge is made possible by the comparative weakness of the mitral valve."

Compounding this unfortunate assumption with another that has been a blot on his fame, Galen stated that some blood passed directly from the right ventricle into the left through invisible pores located in the interventricular septum.

Once in the cavity of the left ventricle, and only there, were blood and pneuma elaborated into the vital spirit. Through their own pulsific properties, the aorta and the arteries drew the spiritous blood from the left ventricle and distributed it throughout the body.

Galen's scheme was a decisive step toward the understanding of the movement of blood through the lungs. To be sure, it introduced the paradox of two-way traffic in the pulmonary vein, and of the selective permeability of the mitral valve for sooty wastes but not spiritous blood, both of which led William Harvey to reconsider the Galenic system. But was not this paradox the first attempt to explain the two simultaneous functions served by the movement of blood through the lungs: the acquisition of a useful substance, and the elimination of a wasteful one?—André Courmand, M.D. *Circulation of the Blood.* Edited by Alfred P. Fishman, M.D., and Dickinson W. Richards, M.D. New York, Oxford University Press, 1964, p. 14.

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of eight cases, one with cardiac catheterization. Am. Heart J. 51: 736, 1956.

The Gift of Communication

To write well, even to write clearly, is a wondy business, long to learn, hard to learn, and no gift of the angels.—John Galsworthy, Foreword to Hudson's Green Mansions.

The Importance of Tradition

Even Pasteur, who enjoyed as much acclaim in his lifetime as any innovator who ever lived, was the object—all his life—of bitter attack and opposition. And he understood that it was inevitable.

"One day, when I was a candidate for a vacant seat at the Academy of Sciences . . . one of the oldest and most dignified members said to me . . . 'My friend, if they stop speaking disparagingly of you in certain journals, tell yourself that you are slipping.'"

Greatness

The greatest doctors I have known have shown serenity, a serenity that comes only from clear purposes and a firm reliance upon tenacity to accomplish them. I venture to call your attention to this characteristic of serenity: it comes from steadiness of conviction, not from frenetic assertions or impassioned credos.—ALAN GREGG, M.D. For Future Doctors. Chicago, The University of Chicago Press, 1957, p. 47.
PULMONIC STENOSIS


Stephen Hales 1677-1761

Stephen Hales, the clergyman of Teddington (1677-1761), who was particularly interested in plant physiology, made significant observations on the exchange between air and blood. Lavoisier later said that he was "the first who examined the problem from the quantitative point of view; he developed several devices, simple and easy to handle, in order to measure exactly the volume of air." In Vol. I of his Statical Essays (1731), Hales described the apparatus making it possible to "take an estimate of the quantity of Air absorbed or fixed or generated by the breath of living animals." In Experiment CVII he measured the amount of air absorbed by breathing, and in Experiment CX he defined the site of absorption, marveling at the vast expanse of the alveolo-capillary membrane:

"... but some of the elasticity of air which is inspired is destroyed and that chiefly among the vesicles... whence probably... acid spirits... are conveyed in the blood which we see by an admirable contrivance spread into a vast expanse commensurate to a large surface of air from which it is parted by very thin partitions; so very thin as thereby probably to admit the blood and air particles... within the reach of each other's attraction, whereby a continued succession of fresh air must be absorbed by the blood."—ANDRÉ COURNAND, M.D. Circulation of the Blood. Edited by Alfred P. Fishman, M.D., and Dickinson W. Richards, M.D., New York, Oxford University Press, 1964, p. 38.

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"PARACHUTE" MITRAL VALVE

Table 1

Right and Left Heart Catheterization

<table>
<thead>
<tr>
<th>Site</th>
<th>Oxygen saturation, Cuvette</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First series</td>
<td>Second series</td>
</tr>
<tr>
<td>SVC</td>
<td>68</td>
<td>64</td>
</tr>
<tr>
<td>RA (high)</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td>RA (mid)</td>
<td>71</td>
<td>59</td>
</tr>
<tr>
<td>RA (low)</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>IVC</td>
<td>78</td>
<td>69</td>
</tr>
<tr>
<td>RV (low)</td>
<td>57</td>
<td>30/0-5</td>
</tr>
<tr>
<td>RV (high)</td>
<td>64</td>
<td>30/15</td>
</tr>
<tr>
<td>MPA</td>
<td>69</td>
<td>M = 25</td>
</tr>
<tr>
<td>RPA</td>
<td>69</td>
<td></td>
</tr>
<tr>
<td>RPA wedge</td>
<td>99</td>
<td>M = 25</td>
</tr>
<tr>
<td>LPA wedge</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>Aorta</td>
<td>100</td>
<td>100/70</td>
</tr>
<tr>
<td>LV</td>
<td>100</td>
<td>100/0-10</td>
</tr>
</tbody>
</table>

SVC, superior vena cava; RA, right atrium; IVC, inferior vena cava; MPA, main pulmonary artery; LPA, left pulmonary artery; RPA, right pulmonary artery; LV, left ventricle.

Note: (1) High pulmonary artery wedge pressures on both sides; (2) there was no difference in pressures between the two chambers of the left ventricle or from these to the aorta; (3) no evidence of a left-to-right shunt.

References


Truth

Where lies the land to which the ships would go?
Far, far ahead, is all her seamen know.—Arthur Hugh Clough. 1819-1861.
mining the presence of a left-to-right shunt.”

The exclusion from his report of results not confirmed by surgery may be responsible for the lack of any overlap in his data. In the present report, minimal lesions are included in patients who did not require surgery and who had well-confirmed lesions on the basis of clinical and laboratory data. It is in patients with small shunts that more sensitive indicators are required.

Although quantification of left-to-right shunts with this technic was not done in the present study, it has been pointed out by others that it is possible to estimate the ratio of pulmonary to systemic flow utilizing inert gases such as krypton-85 and nitrous oxide. This then represents a distinct advantage in this method for evaluating shunts as compared with the hydrogen gas method.

Conclusion and Summary

In 175 patients studied by the krypton-85 inhalation test, 58 patients demonstrated a left-to-right shunt. In six of the cases a shunt was not detected by differences in oxygen saturation. Some overlapping of results was observed and limitations of the method included the requirement for significant blood sampling, irregular chamber mixing, and associated defects. The krypton-85 test is considered to be a useful ancillary method for the detection of shunts. Its sensitivity permits the detection of small intracardiac shunts not demonstrated by oxygen saturation.

References


Lectures and Learning

The proper function of lectures is not to give a student all the information he needs, but to rouse his enthusiasm so that he will gather knowledge himself, perhaps under difficulties.—J. J. Thomson.