

THE WRITINGS OF THOMAS WILLIS, M.D.

DIABETES THREE HUNDRED YEARS AGO

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Diabetes has been described in records dating back to antiquity, but the first important medical treatise on the subject in the English language appeared in the writings of Thomas Willis, published in 1679 under the title "Pharmaceutice Rationalis".

In the opening paragraphs, one finds presented the cardinal symptoms of diabetes, including the polyuria, the polydypsia, and the sweetness of the urine "as if there had been Sugar or Honey in it". It is interesting to read the details in the language of the time, presented under the book and chapter titles which follow:

PHARMACEUTICE RATIONALIS:

or,

An Exercitation of the Operations of Medicines in Humane Bodies. Shewing The Signs, Causes, and Cures of Most Distempers incident thereunto.

SECTION IV, CHAPTER III

OF THE TOO MUCH EVACUATION BY URINE AND ITS REMEDY; AND ESPECIALLY OF THE DIABETES OR PISSING EVIL, WHOSE THEORY AND METHOD OF CURING, IS INQUIRED INTO.

The Diabetes was a Disease so rare among the Ancients, that many famous Physicians have not so much as mentioned it, and Galen never knew above two that were troubled with it; but in our Age, that is given so much to drinking and especially to guzzling of strong Wine, we meet with very frequent, not to say daily examples and instances of this Distemper. But though it be familiar and its appearance well known among us, yet what are the causes and true nature of it, we are almost wholly to seek. Upon which, that I may venture to philosophize or rather give you my opinion, in the first place I shall lay down the description of this Distemper in all its circumstances, or the principal phaenomena (or appearances) of it; and then I shall

endeavor to find out, from what vitiated part or humour all those arise.

The Diabetes, so called from Diabaino (transeo, to pass through) is said to be a swift passing of the potent matter (or drink) or a great flux of Urin. Such as are troubled with this Distemper, piss much more than they drink or take of liquid nutriment; and likewise they have a continual thirst, a lingering Fever, and as it were an Hectick always upon them. But as to what several Authors say, that the Drink is little or nothing changed, there is no truth in their assertion: because in all People (that I ever happened to know, and I believe it to be so in all) their Urin was very different, not onely from the Drink that they took in, but also from any other humours that are usually generated in our Bodies, being exceedingly sweet, as if there had been Sugar or Honey in it. The occasion of the aforesaid error (I suppose) was from the colour of the Urin, which always looks crude and waterish, as in those that are troubled with the Green-sickness or Dropsie. To find out the reasons of these symptoms, let us inquire first, why the Urin is voided so copiously and so quickly, and then proceed to the remaining causes of the Distemper.

The clinical observations were fairly accurate, but the next section dealing with the etiology of diabetes shows how far astray were the speculations of those days. Willis disagreed with the common idea that the disorder originated solely in the kidneys (Reins). He thought that the trouble was mainly in the blood; the participation of the nervous system through the "nervous juice" was also postulated.

Whereas some assign, for the cause of a Diabetes, the attractive quality of the Reins, I do not like their reason; for the Blood is not attracted to the Reins, but is driven thither by the motion of the heart. Nay farther, Neither doth the Serum seem to be drawn out of the Blood whilst it runs through them, or to be, as it were, milked out, but to be separated partly by percolation, and partly by a kind of fusion or precipitation, as I have formerly and clearly shewn. Wherefore I hold that a Diabetes is rather and more immediately a Distemper of the Blood than of the Reins, and that it takes its original from thence, in as much as the mass of Blood doth as it were melt and is too copiously dissolved into serousness; which indeed is very manifest from that vast quantity and great augmentation of Urin, which cannot proceed but from the melting, as it were, and consumption of the Blood. . . .

That therefore I may venture to tell you the immediate cause and true nature of the Diabetes, I am inclined to believe that the temper or mixture of the Blood is so loosened, and in a manner dissolved, that the watery particles cannot be kept in by the thicker ones, but flying quickly out of their embraces, and being impregnated with salt ones, run out through the most open passages of the Reins. But in the mean time to dilute the Blood, and keep it from curdling, other humours both from without and within too, are drawn to, and mingled with it, and the heart is put always into a far more violent motion.

Yet farther, I think that the Reins, also, sometimes are some part of the immediate cause, because their ferment uses oftentimes to be so vitiated, that it cannot keep the Blood by the influx of its lixivial Salt in a due mixture and fluidity, in so much that as the Serum is separated from it by mere percolation; . . . But it is probable enough that copious pissing proceeds in some measure from the ill conformation or make of the Reins; . . .

Now that we have shown the immediate cause and true reason of a Diabetes, let us proceed to find out the procatactical or more remote and original causes thereof. If therefore you inquire why the constitution of the Blood grows so lax and dissolute, and apt to melt, as it were into Serum, I say, that the fusion of this, just as of Milk, proceeds from the meeting and associating of several kinds of Salt in the mass of it, whereby the other particles, being freed from the saline ones (that separate them from each other, and keep them in a due mixture) divide themselves presently into several parties. . . . Nor doth this Distemper proceed onely from things that we take in, but very often also from humours generated within. . . .

But for a principal share in this malady, we may justly bring in the nervous juice; for I have elsewhere shewn that this same juice, if ever it degenerates from its right temper, becomes very malignant and hurtful not onely to other humours, but to the solid parts: and that is the reason that from the depravation of this, the mixture also of the Blood is very much in danger to be perverted. But that the nervous juice it self is perverted, we may conclude, because in a Diabetes the animal spirits are exceeding fainty, and all nourishment is immediately frustrated.

The possibility that Willis recognized diabetic neuritis is suggested by the paragraph which follows:

. . . I have observed in many People who have been

subject to this disease by intervals, that a little before they fell into such a flux of urin, they felt flying, running pains through their whole Bodies, and corrugations sometimes with dizziness or stinging, and other whiles with frequent contractions or convulsions, twinging of the tendons and other disturbances and restlessness of the spirits; which was a certain sign that the liquor which moistened the nervous fibers, being degenerated from its temper, and filled with dregs, did irritate or provoke the spirits, and force them into disorders. And then afterward, when the recrements and superfluities of the nervous juice, having gained a fluidity, ran out into the mass of blood and caused a Diabetes, the aforesaid symptoms ceased, but then there ensued a languishment in the spirits, and a weakness all over the body.

The author finally attempted to leave theory to present further consideration of the clinical picture. However, he immediately returned to further speculation, without finding it possible to come to satisfactory conclusions. "Why it (the urine) should be so wonderfully sweet like Sugar or Honey is not easie to untie".

Willis was familiar with the variable and uncertain course of diabetes which makes prognosis difficult. He was also aware of the fact that treatment is easy when undertaken early. "But as to the Cure of it, it seems very difficult . . . to point out the true way of curing it". Nevertheless, he presented a lengthy discussion of therapy including a case report.

As to its prognosticks or fore-knowledge, this disease at first beginning is oftentimes easily cured; but when grown strong upon a man, very seldom and with great difficulty; in as much as the temper of the Blood, being a little loosened, is reduced without much ado, but when it is much dissolved, so that most of its parts separate from each other, it is hardly or never to be restored.

But as to the Cure of it, it seems very difficult in this Distemper to point out the true way of curing it; for as much as the cause of it lies hid in such obscurity, and has an original so deep and remote. . . . Therefore in this Distemper, as in several others, there are three primary Indications or ways pointed out how to cure it; to wit: the Curatory, Prefervatory, and Vital. . . . Rice, White Starch, slimy Vegetables, and also Gums, and some resinous bodies are used to prove good in this Distemper.

. . . The Vital Indication is performed by thickning and moderately cooling Diet and by Cordials that are temperate, and especially by convenient and seasonable hypnoticks or sleeping Medicins, of which some of the chief sorts and choicest Receipts are laid down in the following Chapter, and in the end of this for a farewell I thought, fit to tell you the story of a certain nobleman who was sick of this Distemper, whilst I first meditated upon and afterward wrote this Discourse.

A Case Report

A certain noble Earl, renowned not onely for the splendor of his Birth, but for the extraordinary qualifications and endowments of his mind, being of a Sanguine temper, a florid complexion and in the very vigour of his Age, (though no body knows upon what occasion) became much inclined to excessive urination; and when for several Months he had been used ever now and then to make great quantities of water he at last (it seemed) fell into a diabetes that was obstinate and strong and almost desperate. For besides that in the space of 24 hours he voided almost a Gallon and a half of limpid, clear and wonderful sweet water, that tasted as if it had been mixed with Honey; he was likewise troubled with an extraordinary thirst, and as it were, an Heckrick Fever, with a mighty languishing of his spirits, weakness in his limbs, and consumption of his whole body.

When at this time I was sent for to consult with these excellent physicians Doctor Michlethwait, and Doctor Witherly, they had prescribed the following remedies by the use of which he in a short time seemed to grow well again.

Take of the Tops of Cypress viii handfuls, of whites of Eggs beaten together, two pints, of Cinamon ℥ ss, when you have cut them small, pour to them of new milk vii pints distil them in the common instruments, taking care that it burn not: and let the patient take ℥ vi thrice a day.

Take of Gum Arabick, and Gum dragant each ℥ vi of Peneds ℥ i make a Powder and let him take about ℥ i or ℥ iss twice a day with ℥ iii or ℥ iv twice a day with ℥ iii or ℥ iv of distilled water.

Take of Rhubarb pulverized gr. xv of Cinamon gr. vi make a Powder and let him take it in the morning, repeating it within six or seven days.

Take of Cowslip water $\frac{3}{4}$ iii, of Cinamon-barley water $\frac{3}{4}$ ii, of Syrup of Poppies $\frac{3}{4}$ ss make a Potion to be taken every night.

His Diet was only of Milk, which he took sometimes raw and diluted with either distilled or barley water and sometimes boiled with white bread, or barley, several times a day. By the use of these things growing daily better and better he seemed within a Moneth to be almost quite well: when he began to be pretty hearty, his Urin which was insipid, did not much exceed the quantity of that liquid matter which he took

in: then afterward growing somewhat saltish it was less than what he drank till at last by degrees recovering his usual tenure of spirits and strength he returned to his former diet.

But yet the disposition to this Distemper did not so totally leave him but that afterward, oftentimes, through disorders in his Diet and perhaps irregularities in the seasons of the Year, being inclined to a relapse he made water at first in great quantities and then clear and sweet with thirstiness feverishness and languishment of his spirits. . . .

The Career of Thomas Willis

Thomas Willis was born in 1621, the son of a well educated land owner who lived near Oxford, England, according to an obituary published in the 1684 edition of his collected works. He attended Christ Church College in Oxford, graduating in 1639. The Civil War was then beginning. His father died "by an Contagion of a Camp-Feaver." He "betook himself again to Oxford, being the tents of the King as well as the Muses; where listing himself as Souldier in the University Legions, he received pay for some years; until the Cause of the best Prince being overcome Cromwells Tyranny afforded to this wretched Nation a Peace more cruel than any War. . . . In the meantime he writ and published those most excellent tracts by which he first became known to the world, viz. Of Fermentation, of Feavers and of Urines."

"At length the King restored and access opened to University Degrees and publick Employs he proceeded Doctor and was publickly declared (in 1660) Professor of Natural Philosophy, which profession he did adorn with the highest praise; moreover, his Anatomy of the Brain, and his Treatise of the Scurvy, and of Convulsions, were published.

"But about the year 1667, being called to London to practice Physick, it is incredible to relate how soon, and with what great Commendations he grew famous. . . ." Although he acquired the largest fashionable practice of the time, he continued to study and write extensively. "But though he spent whole days and nights in care of the sick, he was yet at leisure to adorn his Art by composing Books, from whence among a thousand interruptions he published these Treatises, of

the Ascension of the Blood, and of Muscular Motion, of the Soul of Brutes, of the Diseases of the Brain. . . . "At length being near fifty-seven years of age, in the beginnings of November he seemed troubled with a cough (now the Epidemical Disease of the time) which (while it was thought light and inconsiderable) suddenly passed into Pleurisie and Pneumonia. And when this most expert person was not relieved by frequent Bleeding and diligent taking of remedies, himself perceived the period of his Life to approach . . . he commended his pious soul to God, having his senses entire to the last breath, and finished his most exemplary Life with the like death."

The writings of Willis appeared first in Latin. The collected works were translated by S. Pordage "out of the Latine into our Mother Tongue for the benefit of my Country-men." The first edition published in 1681 must have met with success; a second edition appeared in 1684 with "The Pharmaceutice new Translated and the Whole carefully corrected and Amended."

Pordage, a "Student in Physick," appears to deserve unusual credit. In the book he inserted a valuable table. "Since nothing could do so well express the meaning and intention of the Author as the very Latin and Greek words used in these tracts, we have continued them expressly," he said, "and though in many Places I have given their meaning by Synonyma's, yet for the benefit of meer English Readers we have composed a Table alphabetically of all the hard Greek and Latin words used in the whole volume. . . ." An examination of the table leads to interesting observations, including the definition of the pancreas, "called

in a Hog the Sweet bread. It is a remarkable kernel placed below the Ventricle, and serves for a division of the Vena porta, as also to defend the Ventricle from touching the back. . . . Ventricle, is the stomach, or that part which receives the meat and drink, being swallowed down, and which hath in it self the virtue of digestion."

The volume contains in the preface, a poem which may be quoted in conclusion. Although its meaning is

obscure, it illustrates the scholarly mind of a medical writer of the 17th century.

The intricate and hidden cause of things,
Both Peace and Strife by what means Nature brings,
What various motions Bodies do inspire;
What mixes with the Waters quenchless Fire,
What Bonds the Elements together tye,
Before this happier Age unfolded lye:
Things hid to former Ages, and unknown,
The Secrets of the World to all are shown.

BOOK REVIEWS

TREATMENT OF DIABETES MELLITUS. By Elliott P. Joslin, A.M., M.D., Sc.D.; Howard F. Root, M.D.; Priscilla White, M.D., Sc.D.; and Alexander Marble, A.M., M.D.; New England Deaconess Hospital, Boston, Mass. Ninth Edition, thoroughly revised. Cloth. \$12.00. Pp. 772 with 26 illustrations. Lea and Febiger, Philadelphia. 1952.

An assignment to review this book is something like an assignment to review the Encyclopedia Britannica. For the student of diabetes there is such a great wealth of information here, current knowledge is so fully recognized and treated, experience of the authors is so broad and organization so effective that there is little to say except that everything worth knowing is contained therein. No similar work can approach it in com-

pleteness and authoritativeness. With frequent and intelligent revision none may do so for a long time to come. Continuity in responsible authorship, under firm leadership, is the chief reason why this is true.

From the publishing standpoint the new (ninth) edition is a handsome job. The reasons for this are a rich, green cloth cover, more type area per page and lighter paper stock, so the book is noticeably thinner and easier to handle. There is more attractive type in paragraph and chapter headings. In comparison with the eighth edition, printed six years ago, it has a streamlined look but is easily recognizable as an old friend in new clothes.

The plan of organization of the contents remains the same. In sequence the background, incidence, na-