CLINICAL LECTURES

ON

STRICTURE OF THE URETHRA.

Delivered in University College Hospital.

By BERKELEY HILL, M.B., F.R.C.S. Eng.,
Professor of Clinical Surgery in University College.

LECTURE II.

DEFINITION OF STRICTURE: SYMPTOMS: TREATMENT.

LET us now define strictures. They may be classified as: 1, inflammatory; 2, spasmodic; 3, organic. The last variety is the only one recognised by some surgeons; but I think that, with certain limitations, it is allowable to call stricture some inflammatory or spasmodic narrowings that are undoubtedly met with in practice. First, what is meant by an *inflammatory* stricture? It is simply temporary local congestion and swelling of a part of the urethra; that part being most commonly, if not always, the site of slight previous organic induration; in other words, a stricture of wide calibre which is temporarily exaggerated by inflammatory swelling. *Spasmodic* stricture has been so widely used to explain away difficulties in passing instruments—difficulties which reside in the hand of the operator, rather than in the urethra of the patient—that it has become a byword among surgeons, and is not unfrequently a mere excuse for incompetence. But, in the following limited sense, I believe the term may be correctly employed. By “spasmodic stricture” I understand a narrowing of the calibre of the urethra through contraction of the muscular layers surrounding it; hence only a temporary narrowing, though liable to repetition at short intervals. I have never found this condition “pure and simple”. I have found considerable impediment to the passage of the sound from reflex muscular spasm at the bulbo-membranous part, when there has been also (1) penile organic stricture of moderate or even of only slight amount near the meatus. That is, a fibrous narrowing situate about half or a quarter of an inch from the meatus, which would allow No. 20 bougie or sound to pass, may be accompanied by so much muscular contraction at the bulbo-membranous part, that not only No. 18, but No. 13 or No. 12, would be grasped. This condition is, I believe, frequently mistaken for an organic stricture, size No. 12 French (5½ English), and so treated by the surgeon; whereas, if the band near the meatus be cut sufficiently to allow a large bougie (No. 26 or 27, or more) to pass down the urethra beyond the point of incision, the large bougie will travel readily through the hitherto tight bulbo-membranous part to the bladder. Such a case was before us the other day. (2) Muscular contraction at the bulbous part also occurs when the mucous membrane adjacent is inflamed or swollen, especially if the submucous tissue be the seat of organic fibrous stricture of greater or less amount. When due to inflammation, such strictures are relaxed without instrumentation, by depletion and sedative applications; or, when a slight organic stricture is aggravated by muscular spasm, this aggravation rapidly disappears under the influence of anæsthetics. In no other sense do I recognise the term “spasmodic stricture”.

In true *organic* strictures, the narrowing is due mainly to (1) new plastic production of slowly contracting quality, but also, as already mentioned, in part to (2) vital contraction by muscular spasm. They may be classified according to: 1, their position; 2, the form of the new product; 3, the behaviour of the stricture.

First, let us consider the *localities* of stricture. Commonly, as you know, it is maintained that strictures oftenest develop in the bulbous portion. There is no doubt that severe or widely developed strictures are most frequently found in that situation; not that tight strictures are developed only at the bulb, for both very narrow ones and those resulting from extensive induration may be produced at any part of the spongy portion. Witness the patient on whom I operated before you last week. He had a large gristly mass occupying the last two inches of the corpus spongiosum, and spreading into the glans penis. No. 3 French (No. ¾ English) could with difficulty be passed; yet, as soon as this indurated mass was divided, No. 24 catheter slipped readily into the bladder, showing that no impediment existed at the bulbous portion. But, if all kinds of contraction, slight and severe, be added to-

gether, the first inch of the urethra—perhaps even the first half-inch—is most frequently the seat of stricture. To corroborate this statement, I have extracted from the notes of thirty patients who have applied for cure of long-standing gleet the following. In only five of the thirty was no unyielding area in front of the bulb discovered; in the remaining twenty-five, stricture varying between No. 19 and No. 5 French (9½ and 1 English) was detected in the antescrotal portion. In ten of these cases, the apparently narrowest stricture was at the bulb; but in the fifteen others the bulb was not contracted at all. Further examination of these notes showed that the points most liable to induration and narrowing are these: 1, the meatus and the ends of the navicular fossa; 2, the spongy portion behind the last inch; 3, the junction of the bulbo-membranous portion.

The *form of the new product* varies much. One form, known as *bridle-stricture*, consists of a membranous fold, with slight thickening of the submucous tissue. The new fibres vary in direction, least commonly surrounding the whole urethra. They may be single or several. The *bridle-stricture* is found in the antescrotal portion.

Warts and scars left by ulcers occasionally form stricture.

Lastly, the most troublesome form of organic stricture—indurated areas of the tract of the urethra, in the shape of fibrous nodules or knots which stand forward on the surface of the urethra, causing irregular projections as well as unyielding contractions. Thus they twist the course of the canal and impede the passage of bougies. But, instead of being limited to patches, the indurating tissue may develop evenly along the canal, making it smooth and gristly for a large part of its length, with a narrow passage through the centre. This condition is a far less frequent one than the nodular form. From the foregoing, it is seen that the amount of fibrous thickening may be limited to one or two thread-like bands, or may develop sufficiently to occupy the whole corpus spongiosum except the glans, where induration is rarely ever complete. Furthermore, the fibrous tissue may spread through the perineum, and convert that region into a dense gristly mass with unconquerable tendency to shrink.

The *behaviour* of strictures varies. Some (1) are rigid, and can be dilated only to a very small extent towards the natural calibre of the urethra. Others (2) easily yield and slowly contract; such are of comparatively recent origin and of scanty development. Lastly (3), some yield quickly to the dilating force, and almost as quickly shrink back again to their former dimensions; such are known as “India-rubber” strictures. In cases of advanced stricture, especially where instruments have been much used, the urethra is greatly altered. Between the meatus and the narrowest stricture, it is more or less contracted by additional indurations, sometimes excoriated or ulcerated at one or two points; while just in front of the main stricture there are often perforations of the urethra forming blind passages in the cellular tissue, even reaching into the urethra again, or into the rectum behind the stricture—“false passages”. At the stricture itself, the surface is dull and roughened. Behind the farthest contraction, the canal is much widened and pouched, the pouches being lined by ragged ulcerated tissue. Here also break away fistulæ and urethral extravasations, from the strain to which the urethra is put by the impediment in front. The remainder of the urinary apparatus is also more or less affected. The bladder is the seat of chronic catarrh; its muscular walls are thickened. The ureters are dilated, and with them the pelves of the kidneys are chronically inflamed; the pyramids are flattened, partially destroyed by fibrous interstitial degeneration; the cortical substance is wasted; with other consequences of prolonged chronic irritation.

The *Symptoms* of stricture call for some remark, because those usually put forward as important indicate advanced stricture—when the disease may be always relieved, indeed, but can rarely be cured in the exact sense of that term. It is a common practice to direct the student, when he inquires for stricture, to ascertain the presence or absence of four leading symptoms. They are: 1, diminution of the size of the stream; 2, straining and frequent desire to void urine; 3, pain in passing it; and (though on this stress is seldom laid) 4, scanty oozing of mucus from the meatus in the intervals of micturition—the so-called gleet. Of these, none are pathognomonic; all but the gleet are usually absent until irreparable mischief has been done.

Diminution of the size of the stream, though actually present even when the amount of impediment is very small, is seldom detected by the patient until it has become a considerable feature in his case.

Straining and more frequent calls to micturate are undoubtedly most marked symptoms of stricture, but of stricture that is far advanced, not of the early and easily manageable strictures. So often are they absent, that a patient whose urethra has lost much of its expanding power will deny any change from his usual habit when questioned on this point.

Pain in passing urine is decidedly present only in advanced stricture, while painful micturition is due to so many other urinary affections that it has little value as a symptom of stricture, though it is not unfrequently just the one symptom which induces the patient to consult his doctor.

Though not highly estimated by the surgeon, twisting or forking of the stream is a sign to which patients attach great value as an indication of stricture. With narrow strictures, it is due to the flow of urine being too feeble to dilate the meatus; but it is often caused by irregularity of the outlet without any special contraction of the deeper parts of the urethra, and consequently *per se* does not suggest much to the surgeon.

By contending that the diagnostic value of the symptoms just mentioned has been exaggerated, I do not intend that you should omit to ask for them. I do not for one moment overlook their importance; but I wish you to understand that they may all be answered in the negative and yet stricture may be present.

The only symptom constantly or almost constantly acknowledged is a slight discharge. Indeed, you will find that patients continually apply to you for cure of a gleet, who are quite unconscious that any alteration in their mode of passing urine has taken place, even when examination reveals a diminution of the dilating power of the urethra, which may reach one-half of the diameter. The patient is conscious of nothing more than a slight gleet discharge. He feels no pain, no unusual call to void urine, and marks no alteration in the stream. Hence the importance of ascertaining the cause of any gleet, in order that, if the discharge be due to the contraction of the passage, further contraction may be prevented and a real cure effected. But at the same time do not let me be misunderstood. I do not mean that every gleet is the herald of a stricture, which requires instrumentation forthwith as a matter of course. On the contrary, withhold instruments whenever you have satisfactory evidence that the discharge is not of long standing. How long a discharge may exist without indicating stricture, is uncertain; for inflammatory induration is formed very slowly in some cases, but tolerably fast in others. As a general rule, it is not necessary to search for a stricture when the discharge has not lasted more than four or five months. Be sure, however, that the whole duration of the discharge is contained in the period named, and that there has not been previously a clap or a gleet, of which the discharge complained of is only a continuation.

Treatment.—In treating organic strictures of small calibre—by which I mean contractions at or below No. 18 or 16 French (9 or 8 English), the methods for selection are five: gradual interrupted dilatation; gradual continuous dilatation; forcible dilatation or divulsion; internal urethrotomy; and, lastly, external urethrotomy.

This guiding fact influences the selection of any method; viz., the permanent contractility of all strictures which have developed much beyond the inflammatory stage. However the stricture may be treated, this force always remains. The aim, therefore, should be to obtain dilatation without pain or suffering to the patient, in such wise that the calibre may be henceforth maintained at or near the normal width by the occasional passage of a bougie possessing that width. In saying that the recontraction of any stricture, however treated, is a guiding fact in its treatment, I am aware that I am maintaining an opinion which, though generally prevalent in Europe, has some stout opponents on the other side of the Atlantic, among whom Dr. Fessenden N. Otis of New York and the late Dr. Thomas R. Brown of Baltimore must be mentioned with the greatest respect. They tell us that a cut carried *completely* through a mass of stricture-tissue heals by a new splice composed of non-contracting material, which not merely restores the full calibre to the urethra, but further effects the gradual and complete absorption of the fibrous stricture-tissue from the part cut through. Dr. Otis has recently published his views and his experience in a work on stricture, in which he gives cases where most careful examination of urethras, made some years after his operation had been performed, could not detect any contraction of their calibre, or even the site of the strictures which had been divided (*On Stricture of the Urethra and its Radical Cure*, Putnam's Sons, New York, 1878). Such good fortune has so rarely followed in cases treated by myself, and is so seldom expected by surgeons on this side of the Atlantic, that I think we must not claim, as the termination usually to be expected in the treatment of narrow stricture, that which at best is only an exceptional result. It is true that contraction, so slow as to be imperceptible, does in rare examples succeed dilatation of a stricture; and I have noted such a result to follow treatment both by simple dilatation and by incision. It is just possible that this result is less rare than we suppose; for it is difficult to get further information of patients who leave our hands relieved of their symptoms until they suffer from a repetition, and thus we may include some few really cured among those classified as simply relieved of their

ailment. The longest period of absence of shrinkage after incision I remember is that of a gentleman for whom I divided a stricture in 1871. The patient left for India soon after the operation, with an urethra through which a No. 23 passed easily. After seven years' service, he returned home, when I had an opportunity of passing a bougie. No. 23 went easily to the bladder, notwithstanding that no instrument had been passed since his absence from England. In a tabular statement of the cases of narrow stricture treated in my wards during two years (1876-7), which has been constructed for me by my former distinguished house-surgeon Mr. Francis J. Davies, of Newport, Monmouthshire, each patient's latest report of his condition after discharge from hospital has been entered. In very few, it is likely that no recontraction had taken place even in those cases where the bougie is recorded to have been regularly passed. In some of the cases, it is only too clear that, in spite of the operation and of the subsequent bougie-passage, recontraction has occurred. I shall have occasion to refer again to this table, in illustration of the results gained by the several methods for treating stricture.

To return to the selection of the method to be adopted in any given case: I have employed all the modes mentioned above, and I will allude to them in the order in which they have been enumerated.

1. *Gradual Dilatation by the passage of bougies of increasing sizes at short intervals.* This is the safest of all methods, as it excites the least irritation when being carried out; but, unfortunately, it often fails to obtain an expansion which does not speedily shrink again; and this is especially the case for strictures of the antescrotal portion. It is most efficacious for strictures of recent formation—cases that consist mainly of inflammatory thickening, and especially if these be situate at the bulbous or bulbo-membranous portion. Again, gradual dilatation by the interrupted passage of bougies is sometimes the only prudent course when the patient has evidence of renal disease. Such persons run some risk of acute suppurative nephritis, and even of septic affections, if submitted to cutting operations. But, with these general exceptions, gradual dilatation is an uncertain and most unsatisfactory mode of treatment. Nevertheless, from its simplicity, safety, and non-interference with the patient's pursuits, bougie-passing is very generally applied to all strictures. It commonly gives some relief, even when only imperfect and short-lived. In fine, gradual dilatation by the passage of bougies at short intervals is specially suited (1) for semi-inflammatory narrowings; (2) to widen strictures of long duration, when the kidneys are seriously degenerated, or the condition of the patient much debilitated. In such persons, the consequences of stricture may be relieved and their repetition warded off, by the passage of a bougie once a week or once a fortnight. In these cases, long intervals between the passage of an instrument are not to be expected; but the patient may be restored to comparative comfort and to tolerable health, and thus enjoy a longer lease of life than otherwise would be granted to him. But gradual dilatation is useless for strictures near the meatus, for bridle-strictures, or for dense fibrous perineal strictures.

For the *gradual dilatation* of stricture, three instruments are employed. They are rigid or flexible. The best material for rigid sounds is steel, which is susceptible of a higher polish than silver or plated metal, and is less liable to be scratched or dented. All metallic instruments, as soon as they are withdrawn, should be immersed in scalding hot water and wiped dry while hot. This ensures proper cleansing, and prevents rust. Steel sounds are best preserved for use in a wash-leather case.

The shape of rigid sounds is of great importance. Part of the sound is curved, in order that it may reach the neck of the bladder easily. Though at the penile part the urethra is a freely flexible tube, from the bulb to the bladder it has a tolerably fixed curve, which in most persons is a segment of a circle about three and one-quarter inches in diameter. Hence a sound of similar curve can be most easily passed through the deeper urethra, being less apt than an instrument of larger curve to hitch in the floor, and needing a less rapid sweep of the stem when traversing the deeper portion of the canal than does the short sharp bend of the calculus-sound or lithotrite. This curve, known in this country as Thompson's curve (Fig. 2, No. 11), occupies one-fourth of a circle of three and a quarter inches diameter, and is two and a half inches long. Here is another sound with shorter curve (Fig. 2, No. 1), being one inch and seven-eighths long. It is a trifle shorter than the curve recommended by Civiale, and is that which I prefer for urethral sounds. It occupies one-fourth of a circle two inches and one-third inches (sixty millimètres) in diameter. Being a shorter curve, it is more suitable for urethral sounds which are not required to reach the bladder, while the larger curve is best adapted for catheters which must pass the neck of the bladder. Whether the instrument follow the larger or the smaller curve, it must maintain the curve to its very tip, and not terminate in a straight run half an inch or even an inch long

before the tip is reached, as too many catheters and sounds do. Such straight ends strike the neck of the bladder before entering, and hitch there or give pain. The stem should be straight, seven and a

Fig. 2.—Urethral Sounds.

half or eight inches long, making the length of the sound without the handle about ten inches. Urethral sounds have a broad handle flattened from side to side, to give secure hold to the thumb and second and third fingers. The upper surface of the handle, being parallel with the shaft, is at right angles to the direction of the tip or beak. This disposition enables the operator to be constantly aware of the direction of the beak when using the instrument. Such sounds have the same calibre from handle to beak, being simply rounded at the point.

Conical sounds have the same curve and length, but increase in thickness four or six sizes from the point through the curve to the straight part. This one (Fig. 2, No. IV), for example, measures No. 5 at the beak, and at the junction of the curve with the straight part No. 12. The next size enlarges from No. 10 to No. 18, and so on. Five such sounds constitute a set. It is maintained by those who advocate their use, that they wedge their way through a stricture more readily and dilate it more rapidly than do a succession of sounds of the same calibre throughout.

Bellied sounds (Fig. 2, No. III) come into fashion time after time, but they have never got into general use. In these sounds, the stem is slender, not more than thirteen or fifteen *millimètres*; while at the middle of the curve the sound swells rapidly to twenty or more, and again diminishes towards the beak to thirteen or fifteen, and ends in a slightly bulbous beak. The curve is Thompson's curve, for these as well as for the conical sounds. They are supposed to pass through a stricture more readily than a sound of equal thickness throughout. I use them occasionally for maintaining the patency of a stricture after dilatation.

Flexible bougies are much more generally available than rigid instruments. There are two varieties, English and French, so called to distinguish their shape and quality, rather than the country where they are

made, for the French variety is made in England of better material and quality than those imported from France. The English or "gum-elastic" bougie, tawny brown in colour, consists of a seamless silken tube woven like a stocking, of two or more thicknesses, stiffened and varnished over and over again until a thick smooth coating of copal is obtained. They have an even thickness throughout, are slightly flexible when cold, but, if warmed, become much more supple, and thus can be made to retain any desired curve that may be given to them when warmed, if cooled quickly in that curve; or, if kept for some weeks in the required shape, they take a "set" which they are slow to lose. When made of bad material, they are apt to snap in cold weather or if suddenly twisted. Hence to buy low-priced bougies is bad economy, and disastrous accidents are not unfrequent from pieces of bougie being left in the urethra or lost in the bladder. A well-made bougie, on the other hand, will by long use become rough and unserviceable, but is still tough enough to stand a sharp tug or twist without breaking.

The French or black bougie is, or ought to be, made of a silken tube similar to the English bougie, and varnished with black varnish. It is less durable than the English bougie; but the shape is better adapted to insinuate itself through the urethra. It can, therefore, be passed with less pain or discomfort, and thus is becoming the instrument most generally employed; while the English flexible bougie, like the rigid sound, is reserved for special circumstances. Thus are they shaped. The stem for two-thirds of its length from the handle has an equal calibre. In the last third, it tapers slowly till the last inch is reached, when it rapidly dwindles to a narrow very supple end. The tip itself is slightly enlarged or bulbous, to hinder it from catching in pouches or inequalities of surface. This enlargement is called by the French the "olive"; hence the name *bougie olivaire*, not to be confounded with the bullet-bougie, or *bougie à boule*. Now, on the minute observance of these details depends the production of a good or a bad instrument. Here are two—one good, one bad. (See Fig. 3.) I

Fig. 3.—Olivary Bougies.

must acknowledge that the English workman, in imitating the French production, often fails to reproduce its essential peculiarities. He makes the tapering point taper too slowly, so that, instead of a very

supple end that will bend at once before the obstacle, he makes an instrument that bends slowly along a good part of its length, and so fails to accomplish the intention of the supple end, which is to change the direction of the point quickly, that it may slip by an obstruction and pass on. The "olive" or swell at the tip also is often made much too large; it should never approach the thickness of the stem, but be just sufficient to remove all sharpness from the point. The French tapering bougie can be made to preserve any desired curve against a moderate strain by running down the interior of the bougie a leaden wire, or by filling it with shot. In this way, they are almost as useful as English bougies in the cases where a fixed curve is desired.

When compared with each other, the following are the chief characteristics of rigid and flexible instruments. Rigid instruments are far more difficult to pass, more capable of injuring the patient, and, unless passed with proper skill, more painful to him. On the other hand, they are more durable, can be easily kept in good condition in hot climates, can be made more smooth and, being rigid, their points can be guided by the hand past pouches and other obstructions. Of flexible instruments, the great advantage is their suppleness. This enables them to accommodate themselves to the urethra without strain; but, as their points cannot be easily directed away from an obstruction or false passage, they often slip where a rigid sound readily gains the bladder.

RESEARCHES

ON THE

TEMPERATURE IN PHTHISIS AND SOME OTHER DISEASES:

WITH REMARKS ON THE GENERAL VALUE OF THERMOMETRIC OBSERVATIONS IN DISEASED CONDITIONS.

An Address delivered at the Opening of the Session of the Liverpool Medical Institution, October 1878.

By A. T. H. WATERS, M.D., F.R.C.P.,

Physician to, and Lecturer on Medicine at, the Liverpool Royal Infirmary; President of the Institution; etc.

OF the many symptoms of disease, there is no one more interesting or more worthy of attention than the temperature of the body. The wonderful power which the human economy possesses of maintaining in health an uniform, or almost uniform temperature under varying conditions of external heat, is a phenomenon interesting alike to the student of natural history, the chemist, the physiologist, and the physician; and it is nowise remarkable that the variations of temperature produced by abnormal conditions should have attracted the notice of early observers. As far back as 1638, Sanctorius applied the thermometer to the determination of temperature; and a century later Van Swieten, by improved instruments, made observations which proved that in fever the temperature was higher than in health. De Haen, a colleague of Van Swieten, made further observations, and became aware of the morning remissions and evening exacerbations which characterise fevers; of the rise of temperature in febrile rigors; and of the discrepancies between the pulse and the temperature. He used his knowledge of these changes as a guide to his therapeutics and regarded the return to a normal temperature as a proof of convalescence. No observations of any great value to practical medicine seem to have been made after De Haen's time, until Currie made his important researches; but, although Currie's work on this subject went through three editions, it influenced his contemporaries very slightly. From the time of Currie to the year 1840, but little may be said to have been done in medical thermometry.

At that time, there was commenced a series of painstaking investigations which have never been interrupted. It was not, however, till 1851 that Wunderlich began his researches, which resulted in the treatise so well known to the profession; and thus it appears that, with a few exceptions, to some of which I have referred, it was reserved for the practitioners of the latter half of the nineteenth century to bring to bear instruments of precision in the investigation of this particular phenomenon of disease, and to study it scientifically.

Those who, like myself, began the practice of the profession a quarter of a century ago, well know that at that period no regular temperature observations were made in our hospital wards, and the clinical thermometer was not the constant accompaniment of the practitioner in his rounds. It is, indeed, only within the last twelve or fifteen years that, in this country at least, the instrument has become of daily use, and that, from an accurate record of temperature observations in disease, attempts have been made to generalise on this symptom.

That in the early days of the introduction into practice of a novelty, its value should be either overestimated on the one hand, or somewhat doubted on the other, is only what might be expected. Possibly the use of the thermometer by the inexperienced may have been to some extent productive of error. The recognition of the fact that the temperature had risen a few degrees above the normal may have led to an exaggeration of the patient's danger, and the fear that some serious pyrexial condition was present; whilst, on the other hand, a fall of temperature below the normal may have given rise to the notion that collapse was threatened. The prolonged use of the thermometer has, however, enabled us to avoid errors of this kind—errors which, as they were on the side of caution, were of a very venial kind.

The facts to which I wish to call your attention are the outcome of a long series of careful observations, made either by myself, or under my supervision. They may, I believe, be implicitly relied on. I have thought, therefore, they might be worthy of being made the subject of a discourse which it is my duty, as your president, to address to you on this occasion.

The science of thermometry in disease, although at present but little developed, obviously rests on no uncertain basis. The practical value of thermometrical observations is capable of easy demonstration. The more we can introduce into our practice instruments of precision; the more we can bring into play, in the investigation of morbid phenomena, those senses on which we can most certainly rely;—the more easily will the mind be able to analyse the difficult problems which disease presents; the more shall we tend to raise medicine from the region of pure empiricism; the more easily shall we render the teaching of our art; and the more, therefore, shall we diffuse the knowledge of diagnosis, and of the practical application of therapeutics.

Although the normal temperature of the human body is placed at 98.4 to 98.6 deg. Fahr., this is liable to certain variations, which should be borne in mind in thermometric observations in disease. As regards adults, it is stated by Davy, Gierse, Fröhlich, and Lichtenfels, as the result of observations on themselves, that there is a daily range of about one degree. Sydney Ringer, as the average of a series of observations, makes the range about the same. My own observations on myself give 98.6 deg. as the highest reading, and 97 deg. as the lowest, thus giving a daily range of 1.6 deg.

In children, the daily range is greater; and it is a noticeable fact, that the range diminishes with increasing years; so that in the aged the range is very slight. There appears to be in all persons, of whatever age, a tendency to a fall of temperature in the evening; and in children this amounts to one, two, or three degrees, and begins usually from 5 to 7 P.M., and is rapid up to 9 or 10. The minimum is reached during the early hours of the morning, from 2 to 4 A.M.; and then a rise begins, which may reach its maximum at 9 or 10, but sometimes later. It is very important to bear in mind these alterations of temperature in the diagnosis and treatment of diseases of children; for, as there is a normal rise at certain periods of the day, a single examination at such times might possibly lead to error; and, again, inasmuch as there is a normal fall late in the evening, the recognition of a persistent high temperature at that time might aid us very much in the diagnosis of certain cases of tubercular and enteric fevers, often very difficult diseases to make out in children.

Another question with reference to normal temperature is, whether there is any difference in the temperature in different climates. Dr. John Davy, from observations made on himself, stated that in tropical climates the normal temperature of man was one degree higher than in temperate zones. This statement remained for a long time unchallenged; but of late it has been apparently confuted by the observations of two army surgeons, Drs. Johnston and Boileau. Without referring in detail to their observations, it may suffice to say they have found that the temperature of the human body does not rise under the influence of tropical heat. Dr. Johnston states that the mean of 320 readings was 97.74 deg. Fahr.; and it would thus appear that the normal temperature is rather lower in intertropical, than in temperate climates. At all events, we may, I think, safely conclude that it is not higher, and therefore we must be prepared to recognise a temperature of 99 to 100 deg. as abnormal in both climates.

The first disease to which I wish to call your attention in connection with this subject is phthisis. The development and progress of this affection are marked, as a rule, by elevations of temperature, sometimes of a very striking character. How far these are due to *tuberculosis* or *tuberculisatio*, to the phthisical diathesis, or to inflammatory or other changes incident thereto, or consequent thereon, I cannot at the present moment stop to consider. There are, I believe, no diseases, except *ague*, and *septicæmia*, including *pyæmia*, in which there are alterations of temperature so extreme, characterising the pyrexial and apyrexial