Our erect attitude : an essay / by John Wilson, M.D.

OUR ERECT ATTITUDE:

AN ESSAY.

BY

JOHN WILSON, M.D.

Read before The Glasgow Medico-Chirurgical Society, on 18th November, 1887.

WITH

SUPPLEMENTARY NOTE

Read at a subsequent Meeting.

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OUR ERECT ATTITUDE: AN ESSAY.

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(With Coloured Plate.)

Mr. President and Members,—I claim little originality in this paper. The whole theme and many of its details have been suggested to me by an article in *Belgravia* which I read three years ago, "The Upright Man," by Richard A. Proctor (*Belgravia*, vol. liv, p. 152).

Man glories in his erect attitude. Milton thus pictures Adam and Eve when first seen by the Fiend—

> "Two of far nobler shape, erect and tall;
> Godlike erect, with native honour clad;
> In naked majesty, seemed lords of all."

The attitude is indeed noble, but is it quite in harmony with our present structure? Are our bodies as yet, not more adapted to the prone horizontal attitude of the quadruped? I am convinced that in some important respects they are so, and that a large proportion of our manifold discomforts, disorders, congestions, and displacements are traceable to this same erect attitude of which we boast. Do not suppose that I am going to advocate future progression on all-fours; but rather that the pervading attraction of gravitation, as it affects certain incomplete portions of our structure, must not be ignored in our interpretation of human disorders, and our remedial measures. It is not in an irreverent spirit either, that I would unfold our incompleteness, but I rather view it as suggestive and prophetic of an upward progress towards, though probably never attaining, perfection. As well might I be blamed for deeming the mollusc less complete than the mammal. My very admiration of the wonderfully

beautiful adaptations throughout animate nature, renders me the more keenly alive to any seeming want of adaptation, and especially in my own bodily frame. This essay having been originally written for the Obstetrical and Gynæcological Section, my illustrations are chiefly taken from that realm, but the root principle has a wider scope.

a. The continuous weight of the trunk bearing down on the pelvis, through the vertebral column, tends to the increasing projection forwards of the sacral promontory, and consequent lessening of the antero-posterior diameter of the pelvic cavity; a leading cause of difficult parturition. Quadrupeds are free from this.

The relaxation of the pelvic ligaments, together with slight separation of the bones, experienced by many women immediately before confinement, and which continue for some time afterwards, favour such distortions as downward pressure tends to produce. The chief use of the obstetric binder I consider to be, not so much for direct pressure over the uterus and support of the abdominal viscera, as for keeping in position the loosened pelvic bones until they are re-knit. And as for children, Glasgow furnishes the saddest array of curvatures and distortions of vertebræ and limbs to be witnessed anywhere. These are due primarily perhaps to want of lime, and to modern neglect of such nourishment as porridge and milk; yet secondarily to their being made to stand and walk too soon.

The leading curves of the human vertebral column (cervical, dorsal, lumbar), as distinguished from those of the quadruped, are largely due to man's assumption of the erect attitude. And with these curvatures the actual and relative positions of the thoracic abdominal and pelvic viscera change. These changes increase with age, especially after thirty. The vertebral curves of the infant are comparatively slight, and their viscera are at a high level; but as life advances, a gradual subsidence takes place. In old age the curvature in the dorsal region is often greatly increased. In a beautifully illustrated work by Dr. D. J. Cunningham, of Dublin, titled, *The Lumbar Curve in Man and the Anthropomorphous Apes* (which Dr. Macewen favoured me with a sight of), the subject of vertebral curves is elaborately gone into. In a paper before the Biological Section of the British Association, 1863, Professor Cleland brought forward some important points in connection with the vertebral column of the new born child, with drawings, referred to in Dr. Cunningham's volume.

b. Any original slight version or flexion, or downward dis-

placement of the uterus, is apt to be intensified indefinitely by the continued downward pressure of the superincumbent viscera. Quadrupeds, as a rule, are free from this.

c. Inguinal, scrotal, and femoral herniæ are in the main due to downward pressure on weak points of the abdominal parieties.

d. Vascular congestions prevail in the lower abdominal and pelvic organs and tissues—such as of the uterine venous plexus, the ovarian venous plexuses, the rectal or hæmorrhoidal venous plexus, also in the veins of the lower limbs, which, in spite of their valves, are apt to become varicose, being so influenced by congestions in the upright trunk. Hence the trusses innumerable, the surgical approximation of the pillars of the abdominal rings, the varied apparatus for spinal curvatures, the uterine supports, the abdominal and pelvic binders, the elastic stockings, steel boots, &c., all which attest the crying need of artificial aid.

e. Fæcal accumulations are apt to remain too long in the caput cæcum coli and sigmoid flexure. Not so in quadrupeds. Indeed the horse is enviable in this respect, and the ox too, though somewhat to the laxative side. I can recall a case of confinement where, after birth of child and placenta, a large nodulated tumour was found to the left of the uterus. Fair action of bowels was reported by nurse. A consultation brought no light. I thought of accumulation in sigmoid flexure, and employed enemata and purgatives with conclusive results.

By prolonged fæcal retention, the blood becomes deteriorated, the poisonous elements of the fæces and of their decomposition being absorbed. The general health suffers, the intestinal secretion itself is suppressed, and innumerable complications thence arise, just as in urinary retention and suppression. These auto-toxic effects of fæcal retention and suppression are, I think, too little thought of at the present day in the diagnosis and treatment of diseases generally. Sir Andrew Clark has this very month brought the subject before the London Medical Society in a paper on "Anæmia and Chlorosis in girls."

f. The femoral vessels, artery, and vein, are rendered superficial, and much exposed to injury in man; but they and the adjoining organs are thoroughly protected in the quadruped. In ancient coats of mail there was always an appendage, a hollow shield, which I have seen, called "the cod-piece," for the protection of these parts in warfare.

g. But it is when we examine the internal structure, more

especially the venous system in man, that the disadvantages of the erect posture become strikingly apparent. In adducing the arrangement of the valves of the veins in support of my thesis, I give the average results of anatomical observations only, being quite well aware that there are numerous variations both in man and the lower animals in this department of their structure.

In the veins of man and of the quadruped, a precisely similar distribution of valves is found. These valves, however, though all quite in harmony with the requirements of the horizontal trunk, the drooping head, and the vertical limbs of the quadruped, are not so in man. For example—1. The large inferior vena cava has no valves. They are not required in the horizontal trunk of the quadruped, but in erect man would be of much service in sustaining and counteracting the downward weight of so large a column of blood. Syncope, sometimes fatal, may result by suddenly assuming the upright from the horizontal. The upward blood column fails, and the downward rush through the superior cava suddenly drains the brain, and overcharges the right cavities of the heart. This may prove fatal, unless the horizontal attitude be at once resumed, and a direct stimulus be applied momentarily to the heart. In a case which I saw lately of chloroform syncope, resisting other means, a sponge wrung out of almost boiling water (not simply hot water, much less lukewarm) applied momentarily to the heart, once or twice, at short intervals, proved most efficient: and should, I think, take precedence, along with the Sylvester method of restoring respiration, in any form of syncope. Such means in short as have the direct effect of reviving simultaneously both circulation and respiration; for either without the other must fail. A small phial of sulphuric ether and hypodermic syringe in good order should also be at hand for such emergencies, and perhaps a few nitrite of amyl capsules. As regards the resuscitation of new-born children, the swinging and inversion method of Dr. Schultz, of Jena, has been successful in the hands of Dr. W. L. Reid. In the administration of anæsthetics the danger of the upright posture has been well emphasised quite recently by a member of this Society. Again, in the emptying of a greatly distended bladder, or in tapping for ascites, or in removing the contents of the uterus in labour (the support hitherto given to the large abdominal veins being rapidly withdrawn) the horizontal posture of the patient is best. On the other hand, in the old days of excessive blood-letting, when the direction used to

be "*sanguinem mitte ad deliquium*," the sitting posture was necessary to prevent the patient bleeding to death—*deliquium ultimum*, indeed!—the blood flowing very freely in the horizontal.

2. The superior vena cava has no valves. They are not required in man nor in the quadruped.

3. The azygos veins have, as a rule, no valves. They are not required in the quadruped, but might be very useful in upright man.

4. The portal vein, with the mesenteric veins, and contributory branches, have no valves. In the horizontal posture the blood flows freely towards the liver from all their remote plexuses, and the plexuses of the general venous system with which these inosculate; but in the upright attitude unopposed gravitation produces many congestions—*e. g.*, rectal, vesical, prostatic, uterine, ovarian, &c. In the vesical and uterine plexuses, indeed, the venous blood is apt to become so stagnant as to form calcareous concretions — phlebolites. Around the spermatic cords, and their analogues in the female, the round ligaments, as they issue from the external abdominal rings, varicose tumours are often formed, which closely resemble those of oblique inguinal hernia. It may be urged that the tortuous, inosculating veinlets which form a plexus, running in all directions, both in man and the quadruped, could not possibly have available valves, and are independent of them, whatever posture may be assumed. It is true they themselves have no valves, but the direction of the blood current through them is regulated by the main stream in the vein or veins which they unite to form; and if these veins are horizontal they do not require valves; if vertical and below the heart, they do, to avert congestion in their contributory plexuses.

5. The external iliac and common iliac veins have no valves; and this want, though not felt in the quadruped, must tend in man to produce varicose tumours lower down in the limbs, even though the veins there be well supplied with valves.

6. *On the other hand*, the intercostal and lumbar veins *have valves*. They are useful in the quadruped to support the vertical streams of blood on their way to the azygos veins and vena cava, but *unnecessary* in erect man. Yea, when he leans backwards, or actually lies on his back, they prove positively prejudicial, inasmuch as their undue direction or guidance of blood towards the spine, with only partial reflux (under the rhythmical pressure of the expanding chest and abdomen)

is apt to cause congestion there. For we know that the intercostal and lumbar veins receive blood from all the vertebral plexuses: *the dorsi-spinal*, or the plexus which surrounds the bones and intervertebral cartilages; *the meningo-rachidian*, or that around the dura mater; and *the medulli-spinal*, the innermost of all, that around the pia mater and arachnoid. So that the venous stream in all these plexuses is apt to be retarded by the intercostal and lumbar valves, in the upright posture, and still more so by the joint action of these valves, with gravitation, in the recumbent. Indeed, Brown Séquard recommends the prone posture for relief in spinal congestion. And any one who, when fatigued, has tried kneeling at a sofa, and throwing the body obliquely forwards over the cushion, knows what relief to the whole circulation and what rest it gives. And most of us must have seen how a fretful, restless infant has been made quite comfortable by being laid face downwards over the nurse's knee (not, of course, with a view to discipline). A young married lady told me not long ago that she had always the soundest and most refreshing sleep in this posture. And a conscientious youth who had fatiguing work all day, informed me that he felt specially restful while he knelt and bent forwards at his evening prayer, though when he did get lain down in bed he could not sleep. I have seen, in Mr. Hilliard's, a simple sloping couch, to the raised end of which work-table or piano may be brought; very suitable for such cases as require the prone posture.

7. The veins of the limbs are well supplied with valves. They are useful in man, and specially useful in the four vertical limbs of quadrupeds. Why I say specially useful in quadrupeds is that, while their limbs are rarely other than vertical, the arms of man may be either raised, or horizontal, or hanging; and it is only in the last position that valves are required. The Americans might almost dispense with them in their lower limbs, so often sloping upwards at forty-five degrees.

8. The jugular veins have valves, and also some of their contributory veins, as Dr. John Struthers demonstrated in man many years ago. Their use is evident in the lower animals, with their dependent necks, but not so evident in the erect human neck. Here is the left external jugular vein of the horse, extending from the lower border of the parotid gland to the subclavian vein. I saw it dissected out by Mr. A. S. M'Queen, Demonstrator under Dr. Limont, at the Veterinary College. It is slit open to show the four double-cup valves,

at intervals of between two and three inches. I have tanned the specimen with bichromate of potash, and stuffed the cups with cotton wool. Dr. Struthers regarded their chief function in man to be the partial prevention of reflux from the subclavian vein. This is undoubtedly true, and thus they may help to save the brain from congestion during any violent exertion or when the head is hanging downwards. Yet it is no less true that their arrangement would be similar, and even more necessary, in a dependent neck. The venous valves are extremely delicate, transparent curtains, which cannot bear great strain, and must all admit of more or less reflux. This seems to be a provision for safety, especially in man. Very different in strength are the semi-lunar valves of the pulmonary artery and the aorta, as may be judged of by this wax cast of the completely closed aortic valves, obtained in the late Professor Allen Thomson's anatomical rooms twenty-five years ago.

h. The head of man as it is balanced on the summit of the vertebral column, with its merely rudimentary ligamentum nuchæ, so amply developed in the ox and horse, undoubtedly indicates that it should be held erect; but as we have seen, there is a measure of incompleteness as yet in the adaptation of the neck itself, and the whole internal structure, to this attitude.

i. Children instinctively at first take to all fours, and only gradually come to trust the tiny double pedestal of their baby soles. And in bending old age the necessity of the staff is distinctly suggestive of a quadrupedal alliance. It may not be so evident, at first sight, in the case of some who carry canes, such as doctors, and attractive young damsels of the period; but still! The serious falls on the slippery pavement at this season are chiefly due to our imposing tallness and limited foothold. We never hear of a dog or cat suffering from such accidents. Draught horses, indeed, often come down when their iron shoes cannot grip the icy causeways. Riding horses also often miss their footing and roll over. Yet how much more frequently would this occur were they bipeds. Our limbs, however, differ essentially from those of the quadruped in form, articulations, and muscular attachments, and are in every respect intended for the upright gait. Creeping is anything but graceful beyond the months of childhood.

j. Richard A. Proctor speaks of Dr. S. V. Clevenger, formerly Professor of Comparative Anatomy and Physiology in the Chicago University, as having called special attention

to this subject; and I bring it before this Society not as a mere speculation, but as embodying a principle which I conceive has much significance in every branch of the profession. In practical gynæcology and obstetrics, for example, the great lesson it teaches is the hopelessness of effectively relieving versions, flexions, displacements, &c., without taking into account, more fully than hitherto, the as yet incomplete adaptation of the human frame to the erect posture; the ignoring in a great degree the all-prevailing attraction of gravitation; and the importance of the prone posture, more or less, along with other means, in the relief of almost all such disorders.

k. Without this, other means, however promising, are at best unsatisfactory. When a retroverted or retroflexed uterus for instance, is borne down by the superincumbent viscera, the patient may be put in the genu-pectoral posture, and the uterus may be replaced by steady upward pressure on the fundus, through vagina or rectum, as recommended by Dr. Matthews Duncan; the uterine axis may be straightened by stem or bougie; the uterus itself may be kept in position by vulcanite pessary; or, if necessary, the depressed fundus may be drawn upwards to the inguinal canal by means of the round ligaments, and steadied there, as in Alexander's delicate operation, which certain members of this Society have virtually made their own. But that such measures, or any other, may have fair play, ample rest in the horizontal, and chiefly in the prone or partially prone posture, is very desirable; the chief difficulty being how to carry this out for a sufficient length of time, especially among the working classes and the poor.

l. Again, the ordinary, and very prevalent congestion of the mucous membrane of the os and cervix, with eversion, which conditions were formerly too little distinguished from ulceration, and even from cancer, are undoubtedly maintained and intensified by the upright posture, by walking, or long standing, or hanging about on the feet, as most ladies do in shopping, and working men's wives at the washing tub, and by a cold atmosphere, just as similar affections of the rectum are. So that any means likely to mitigate this condition and to yield comfort—*e.g.*, a glycerised tampon to reduce turgidity, some local astringent, replacement of the protruded membrane, and, if there be notable fissures, Emmet's trachelorrhaphy—any such means, I say, still require as their complement a due and liberal observance of horizontal rest.

m. Thirty years ago, Mr. John Hilton, Surgeon to Guy's Hospital, demonstrated the importance of mechanical and

physiological rest in all medical and surgical disorders. And to secure this, the removal of pain, he showed, was primarily indispensable, not for its own sake alone, but for the physiological rest which its absence gives to injured tissues. Now, on the same rest-giving principle, may not the prone horizontal posture relieve many disorders by lessening, among other effects, the painful strain on the heart and vessels which the constant vertical attitude entails.

Weariness is almost universal. Ere half the day is done most people experience what is called "a feeling of sinking." The vital force has a hard struggle with the forces of bodily gravitation and atmospheric pressure exerted on the upright frame. Not only those persons who have no definite pursuit groan under the constant sense of lassitude, but the industrious are ever longing for ability to work without fatigue. I do not wonder at the very prevalent craving for artificial stimulants and sedatives, alcoholic and non-alcoholic. This general experience of oppression and weariness, together with the very ample provision made everywhere to meet it, are, to my mind, clearly indicative of the imperfect adaptation of our bodily frame to its present environments.

n. Some vague perception of human incompleteness must have been experienced and expressed by the ancients in their emblematic combinations of man and quadruped—by the Assyrians, for example, in their winged, human-headed bulls and lions; by the Egyptians, in their human-headed lion or sphinx; and by the Grecians, in their human-headed and human-breasted horse or centaur. Many a glorious human form also came forth from the marble quarries, under the chisel of the Greek sculptor. So noble are some of those still preserved to us, that they seem to anticipate our highest ideal. And yet, in the words of the learned Principal of our University, in his recent opening address—"The Hellenic ideal is simply that of finite completeness; of a finite consciousness in harmony with itself and the world."

o. Our present imperfection, however, as I have hinted, is prophetic of a more perfect adaptability to the upright, yet to be attained; through what process—evolution, direct intervention, or otherwise—remains a mystery. Adelaide Anne Proctor, sister of Richard A., has, in her *Legends and Lyrics* of 1863, these lines:—

> "Nothing resting in its own completeness
> Can have worth or beauty, but alone,
> Because it leads and tends to further sweetness,
> Fuller, higher, deeper than its own.

"Spring's real glory dwells not in the meaning,
Gracious though it be, of her blue hours,
But is hidden in her tender leaning
To the summer's richer wealth of flowers.

. . . . . .

"Life is only bright when it proceedeth
Towards a truer, deeper Life above;
Human love is sweetest when it leadeth
To a more divine and perfect Love.

. . . . . .

"Nor dare to blame God's gifts for incompleteness,
In that want their beauty lies; they roll
Towards some infinite depth of love and sweetness,
Bearing onward man's reluctant soul."

When I speak of our present bodily incompleteness being prophetic, the thought is implied of a continuity of the present with a future body, more complete. And this can only be through the continuous identity of the primal, material germ (or probably dual germ) whence and around which the body grows. For though *all the other* elements of this present frame during life are being continually exchanged with those of other creatures, and at death are wholly given up without return, still, if this invisible material germ remain, *unappropriated by any other creature*, a future body, having indissoluble links with the present, is as possible as the present is. In short, it seems not inconsistent with science to say, "I believe in the resurrection of the body." Voltaire's missionary—eaten by the cannibal, who in turn is devoured by the tiger—may, after all, have preserved to him his invisible material germ, around which another body, not so easily tired, yet essentially one with the first, may grow.

I am indebted to the late Professor George Wilson, of Edinburgh, for this thought, which is expressed in his *Religio Chemici*, published in 1862 by his sister after his death.

p. In the meantime, Gentlemen—descending from these Alpine heights, from that rare atmosphere, to sea level, a region of much greater barometrical pressure—were it not for our incompleteness, our want of adaptation to the erect attitude, there would be much less need than now exists for our valuable services as physicians, surgeons, obstetricians, and gynæcologists; and this, you must admit, would never do at all. Seriously, however, the observations I have adduced regarding the incomplete adaptation of our structure to the upright may throw light on many an obscure disorder, and

lead to its relief or cure. Hilton's great principle of the necessity of *physiological* as well as *mechanical rest*, is, to my mind, as brilliant a discovery in medicine and surgery as that by Sir Isaac Newton in the sphere of astronomy. Under the influence of this double star my small corollary is set. And the object of this essay is to show that there exists in our nature an incomplete adaptation of structure to the upright, and that some compensatory adjustment is needful for perfect physiological and mechanical rest.

SYNOPSIS.

Introductory (*Richard A. Proctor, Milton*).
a. Vertebral downward pressure on Pelvic Bones.
b. Visceral downward pressure on Pelvic Viscera.
c. Herniæ.
d. Congestions—Hæmorrhoidal, Vesical, Prostatic, Uterine.
e. Fæcal accumulations.
f. Exposure of Femoral Vessels, &c.
g. VENOUS SYSTEM—

1. Vena Cava Inferior,	Without Valves.
2. Vena Cava Superior,	
3. Azygos Veins,	
4. Portal Vein and Mesenteric Veins,	
5. External Iliac and Common Iliac Veins,	
6. Intercostal and Lumbar Veins (Spinal Congestion),	With Valves.
7. Veins of Limbs,	
8. Jugular Veins,	

h. Human Head.
i. Human Limbs.
j. Significance of Posture (*Dr. S. V. Clevenger*).
k. Posture in Retroflexion and Retroversion.
l. Posture in Congestion of Os and Cervix.
m. Mr. John Hilton—Physiological and Mechanical Rest.
n. Ancient Emblematic Combinations and Greek Sculpture (*Principal Caird*).
o. Incompleteness prophetic (*Adelaide Anne Proctor*).
p. Conclusion.

SUPPLEMENTARY NOTE.

(*Read at a Subsequent Meeting of the Society.*)

MR. PRESIDENT AND MEMBERS,—My essay on "Our Erect Attitude" now appears in the *Glasgow Medical Journal* of this month. The synopsis and diagrams will remind you of its leading features. I hope I have been successful in guarding against two possible accusations which strike most people at the first blush of such a subject as this. 1st. That I have any wish to see human beings become quadrupeds; and 2nd. That I am so infatuated as to dream that had the construction of the human frame been committed *to me* it would have been, long ere this, perfection itself.

The downward attraction of gravitation on the solid and fluid constituents of our bodies at sea-level is very great, and it is only slightly lessened at any attainable elevation. Such lessening is only in proportion to the inverse ratio of the *squares* of *the two distances* from the *earth's centre;* the two distances being, 1st. That from sea-level to earth's centre; and 2nd. That from elevation above sea-level to earth's centre. Accordingly, a person weighing 10 stones at sea-level would, on the summit of Mont Blanc (which is about 3 miles in perpendicular height) show (with a spring balance) a diminished weight to the extent of only $\frac{1}{4}$ lb. Thus—

Let 4,000 miles represent the mean radius of the earth from centre to sea-level.

Let 4,003 miles represent distance from earth's centre to summit of Mont Blanc.

Let 10 stones or 140 lbs. be the weight of body at sea-level.

Then the square of 4,003 miles is to the square of 4,000 miles, as 140 lbs. is to $139\frac{3}{4}$ lbs. Showing that the body is only $\frac{1}{4}$ lb. lighter at summit than at sea-level.

I think that a small *spring balance* might be constructed, having a minutely divided scale with index, and attached to it a definite weight at sea-level, say 1,000 grs. This would indicate diminution of weight at various elevations, and also serve to adjust aneroid observations of height. Of course, any balance with scales and weights could be of no use for this purpose, as the contents of each scale would be equally influenced by gravitation at all elevations. 1,000 grains at

sea-level, when weighed in a spring balance at the summit of Mont Blanc, will be found to have lost only 1½ grains, so that any pocket spring balance, such as I suggest, would require a very sensitive spring and a very minutely graduated scale, to tell intermediate weights and heights.

There is, however, a much more complex force constantly acting on and around us—namely, that of the atmosphere, by its weight, tension, electricity, light, heat, moisture, chemical and vital influences. With the ever varying proportions of these influences our whole solid and fluid constituents are affected. The barometer may indicate the *weight* of the atmosphere, but not its other influencing qualities. Hence some persons feel most light and vigorous in a heavy atmosphere, while others feel oppressed. It is a common custom, no doubt, when men casually meet, to congratulate one another on a *rising barometer.* But a *rising barometer* really means *increasing atmospheric pressure or tension;* and a *falling barometer* indicates a rarer or lighter atmosphere, such as that breathed in ascending a hill. For my part, I experience a grateful sense of relief when, after long atmospheric tension, dryness, an east wind, and high barometer, the index suddenly drops backwards, and there is genial west wind, with rain. From an aneroid chart which I made in March, April, and May, 1885, I find that only once was there a hilly atmosphere, the other daily atmospheres being rather like those of a coal-pit at varying depths. Throughout these months the barometer was unusually high.

The pressure of the atmosphere at sea-level, in this latitude, is about 15 lbs. on every square inch of surface. At Davos Platz, Maloja, Audermatt, and other Alpine resorts for invalids, which range from about 5,000 to 6,000 feet above sea-level, the atmospheric pressure is much reduced. At the summit of Mont Blanc (3 miles in perpendicular height) it is about 7½ lbs. on the square inch, only one-half that at sea-level.

Professor Tyndall, in an address to the students of the Birkbeck Institution, Liverpool, October, 1884—referring to his life among the Swiss Alps, says (had he not lived there)—"the person who now addresses you would undoubtedly be a different man from what he is. His bone would have been different bone; his flesh different flesh; nay, the very grey matter of his brain, which is said to be concerned in the production of thought, would have been different from what it is."

Such salutary results, however, are not solely due to the *rarity* of the atmosphere at these altitudes. Many subtle

atmospheric influences, as I have said, are at work besides this, in helping the frail body there, in its wrestling with the adverse forces of nature. Moreover, at these snowy altitudes, the elsewhere numerous and potent septic germs are greatly reduced in number and do not thrive. Referring to his heavy brain work on the Continent, Professor Tyndall says—"In those days I not unfrequently found it necessary to subject myself to a process which I call depolarisation. My brain, intent on its subject, used to acquire a set, resembling the rigid polarity of a steel magnet. It lost the polarity needful for conversation, and to recover this, I used to occasionally walk to Charlottenburg or elsewhere. From my experiences at the time, I derived the notion, that *hard thinking* and *fleet talking* do not run together."

Moreover, there is a limit to the *beneficial* effects of *relief* from *atmospheric pressure*. The whole frame is kept knit together thereby. It has been demonstrated by Herr Weber that the heads of the humeri and femora are kept in their sockets chiefly by it; and in great balloon ascents epistaxis and other hæmorrhages have occurred, showing that the strength of the blood-vessels is not adapted to a lessening of atmospheric pressure beyond a certain degree, and, conversely, that a considerable amount of atmospheric pressure is needful to their tone and integrity.

It is thus evident that *atmospheric pressure* could not be wholly dispensed with at present, nor the much less varying *bodily gravitation*, if we are to be kept down to earth and its duties, even though at times the Psalmist's wish may arise—"Oh that I had the wings of a dove, that I might fly away and be at rest."

Man is too great to *hasten* other than *gently*. The motto of his history is *Festina lente*. He has a longer helpless infancy than any of the lower animals. His development is of slow growth. His cycle has a wide arc; "as if," in the words of a thoughtful Christian author, "as if to him *time were no object*, and *no elaboration of growth were too great for his futurity!*"

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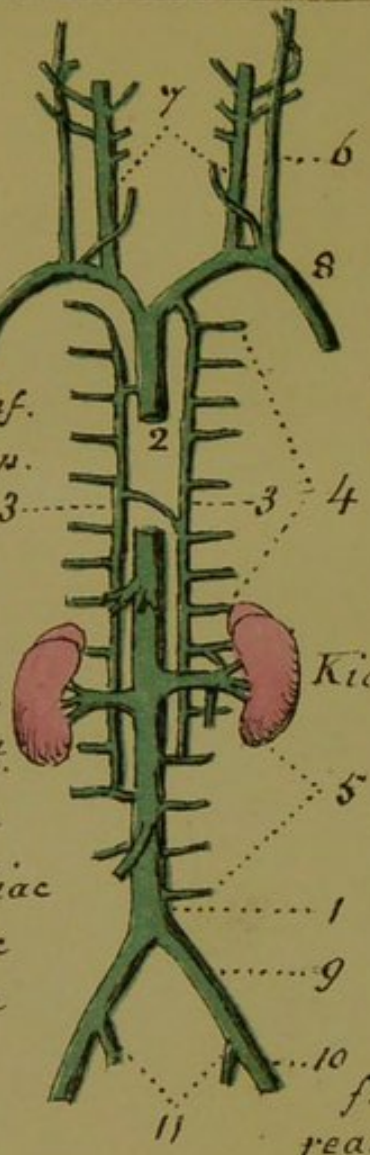
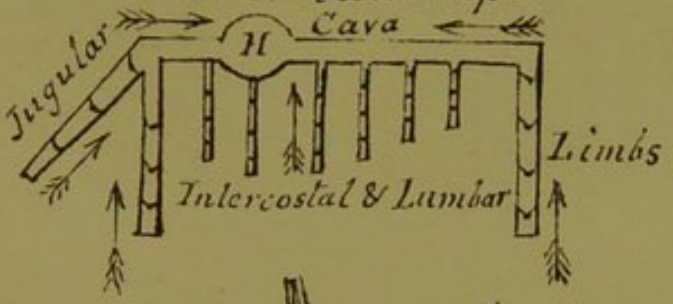
General Venous System

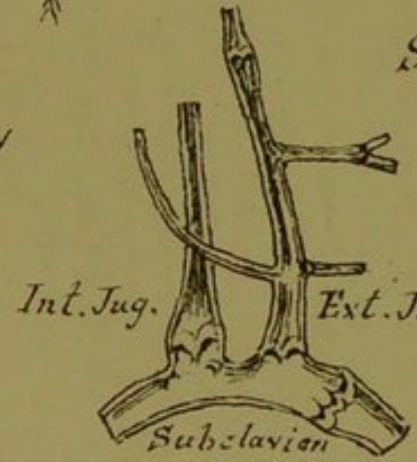


1. Vena Cava Inf.
2. Vena Cava Sup.
3. Azygos
4. Intercostal
5. Lumbar
6. Jugular. Ext.
7. Jugular. Int.
8. Subclavian
9. Common Iliac
10. Ext. Iliac
11. Int. Iliac

Kidney

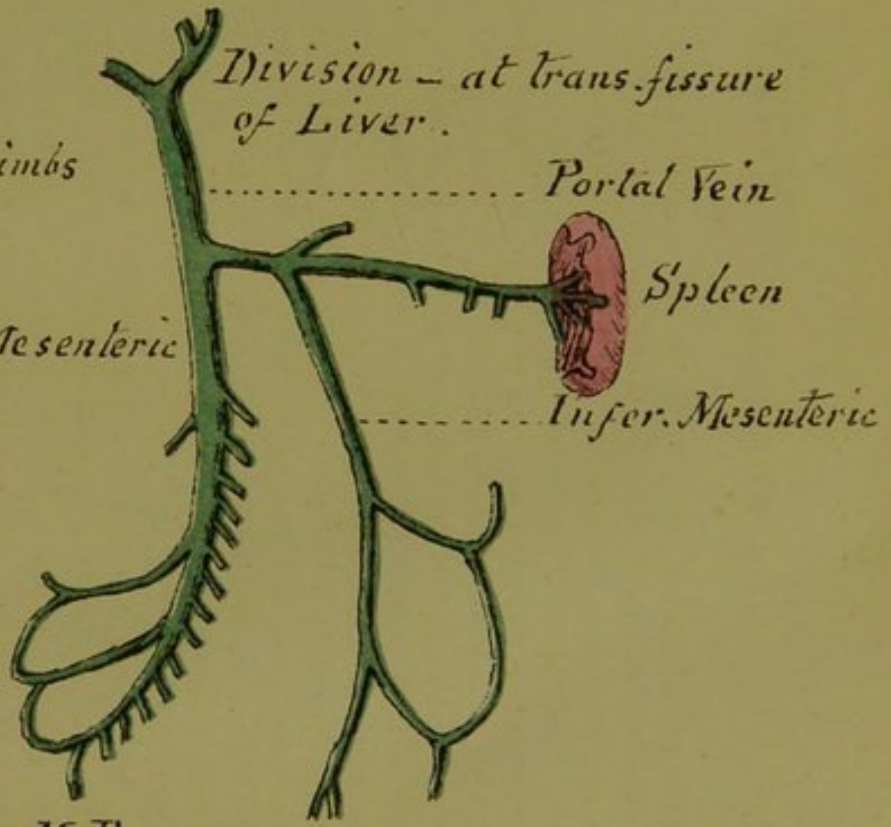
Arrangement of Valves in Man & Quadruped





Valves of Veins of Neck
from paper by John Struthers M.D.
read before Edin. Med. Chir. Soc. Sess. 1855-6.

Portal System



J.W. Jan. 1888.