THE ESTIMATION OF THE TRANSVERSE DIAMETER IN THE PARTURIENT WOMAN.

By ALFRED C. SANDSTEIN, M.D.

THE obstetrician, in dealing with parturition, has three elements to consider—the powers, the passenger, and the passages. He can satisfy himself as to the condition of the powers, the passenger, and the *soft* parts of the passages, and he can gain a certain amount of information as to the bony passages; but it is here that a narrower limit bounds his knowledge, for the true pelvis, with which the processes of labour mainly concern themselves from the point of view of the difficulties of parturition, consisting of brim, cavity, and outlet, offers itself for investigation in the living subject almost entirely at its outlet and, to a lesser extent, in its cavity. That part through which the foetal head has first to pass, which therefore offers resistance in the early part of parturition—namely, the inlet—is the furthest removed from the touch of the obstetrician. It is not entirely inaccessible, for we can touch the upper end of the symphysis pubis externally above the pubes, and the sacral promontory *per vaginam* through the posterior fornix. But, with these reservations, it is practically so, for the inlet is an ellipse, and in order to find out its condition its conjugate or antero-posterior and its transverse diameters must be known.

Now, the points that bound the true conjugate can be got at individually, the one *per vaginam*, the other suprapubically; but with our fingers alone the examining hand cannot touch both these points at the same time. Various pelvimeters, such as that of Skutsch, have been invented to overcome this difficulty, but none are in general use, if in use at all, and the obstetrician is compelled to rely on the relation between the diagonal and true conjugates as ascertained in the dead subject, and to apply it in practice to the living. The weakness of this is confessed by the recommendation to subtract $\frac{3}{4}$ inch instead of $\frac{1}{2}$ inch from the diagonal conjugate of a rickety flat pelvis to get its true conjugate.

The transverse diameter of the brim is in even a worse position, for, Skutsch's pelvimeter excepted, there has been no attempt made to ascertain its condition.

The transverse diameter has, of course, been measured in the pelvis of the dead subject, and given the length of 5 inches. It is certain that anything below this is abnormally small. Parvin* places it at 13.5 cm., about $5\frac{2}{5}$ inches. Playfair* gives it as $5\frac{1}{8}$ inches,

* *Vide* respective text-books.

and in twenty-eight cases taken at random in the post-mortem room I found that it averaged $5\frac{1}{16}$ inches. This is in a normal pelvis; but when we come to abnormal pelves the length of the diameter may be anything above or below this. We can, of course, guess whether the diameter is likely to be large or small in life from the size and general shape of the pelvis, but no accurate estimation has hitherto been possible in actual practice.

Importance of knowing the Length of Transverse Diameter.—It is a matter of no little importance, however, to know the length of the transverse diameter during life. Suppose two pelves, each flat rickety, and each with a conjugata vera of $3\frac{1}{4}$ inches. Here the treatment lies between forceps and version; but in the one case there may be a transverse diameter of $5\frac{1}{2}$ inches, and in the other only $4\frac{1}{2}$ inches. Obviously, as the head in version enters the brim in the transverse diameter, there would be much more room in the one case than in the other, so that, not only would it help in the decision between forceps and version, but in cases where we could determine the length of the transverse diameter it might decide us to perform embryulcia when the smallness of the transverse offered little chance of the delivery of a living child, rather than by a forcible extraction to injure the maternal passages.

Calculation of the Length of the Transverse Diameter in the Living Female.—The calculation of the length of the transverse diameter of the brim in the living subject is perfectly easy by a very simple mathematical calculation. All that has to be done is to measure the length of the intercrystal diameter. This extends between the two widest apart points in the same transverse plane on the summits of the iliac crests. Divide the number thus got by two, and that represents the length of the transverse diameter of the brim in that particular pelvis. This very simple and easy measurement, and the simple process of dividing it into two, gives the transverse diameter, and that very closely. I was first led to make this observation during my experiments on symphysiotomy.* It occurred to me that it would be interesting to see if, in the twenty-eight pelves which I experimented on, in fresh cadavera and taken at random, there existed any fixed relation between those diameters which lay in the same plane as the transverse diameter of the brim, and the transverse diameter of the brim. These measurements were not made to test this relation, but after the measurements had been made for other purposes the idea simply came that it would be well to see if any such fixed relation did exist. On tabulating the inter-

* *Vide Journ. of Obstet. and Gyn. of Brit. Emp.*, March, 1902.

cristal, the intertrochanteric, the interspinous, and the transverse of brim, to my surprise the intercrystal diameter averaged exactly double the transverse.

Original Cases 1 to 28.—I have tabulated these 28 cases at the beginning of my list of measurements in my thesis for the degree of M.D. The following table is the average length of these diameters in them, and shows the relation that exists :

Diameter.	Average Length in—	
	Inches.	Centimetres.
Intertrochanteric	11'3	28'7
Intercristal	10'1	25'7
Interspinous	8'8	22'5
Transverse (brim)	5'1	13'05

I may mention that all the measurements were made with Prochownik's callipers, lent me by Professor Simpson. In 22 cases the transverse diameter of brim exceeded half the intercrystal by a range of $\frac{1}{50}$ inch (0'5 mm.) to $\frac{3}{10}$ inch (2'25 cm.), and in 6 cases it was less than half the intercrystal diameter by a range of $\frac{2}{25}$ inch (0'2 cm.) to $\frac{3}{10}$ inch (0'75 cm.).

RELATION BETWEEN TRANSVERSE AND HALF INTERCRISTAL.

	Mean.	Average.
In 22 cases Tr.* exceeded $\frac{1}{2}$ I.C.† by	$\frac{3}{10}$ in., or 0'75 cm.	$\frac{7}{25}$ in., or 0'7 cm.
In 6 cases Tr. was less than $\frac{1}{2}$ I.C. by	$\frac{3}{10}$ in., or 0'75 cm.	$\frac{8}{25}$ in., or 0'8 cm.
In all the 28 cases the difference between Tr. and $\frac{1}{2}$ I.C. was ...	$\frac{3}{10}$ in., or 0'75 cm.	$\frac{8}{25}$ in., or 0'8 cm.

So that in these 28 cases the relation between the transverse diameter of the brim and half the intercrystal diameter was correct to $\frac{3}{10}$ inch. In 18 of them the calculation would have been out only from about $\frac{1}{3}$ inch to $\frac{1}{50}$ inch. As this discovery was sufficiently exact and important to make me wish to carry the investigation further, I have done this.

But first of all I must acknowledge my indebtedness to Professor Simpson, not only for the use of instruments, but also for his great kindness in allowing me free access to all his museum specimens ;

* Tr. means transverse diameter of brim. † I.C. means intercrystal diameter.

and to Dr. Barbour and to Mr. C. W. Cathcart for similar kindnesses at their hands.

Further Investigations: Technique.—The instrument used by me was Prochownik's callipers, lent me by Professor Simpson. The advantages of these callipers lay in the exactness of the measurement to millimetres, and in the fact that by simply closing the handles to zero, swinging round the bar on the pivot thus formed at the end of the handles, and then crossing the arms, the internal diameters could be measured, reading now the scale from right to left. I tabulated my pelves in the chronological order of measurement, so that the number of each pelvis served as an index to it, and I measured the intercrystal diameter twice, in the one case between the outer edges of the crests, and in the other between the summits of the crests. This at once established the fact that the intercrystal diameter must be measured and considered as extending between the summits, and not the outer edges, of the iliac crests. The reasons for this are obvious: (1) Because the amount of projection of the outer lip of the iliac crest varies not with the pelvic capacity, but directly with the muscularity of the individual, and a muscular woman does not necessarily have a capacious pelvis; (2) because the outer lip of the iliac crest is a projection at right angles to the plane surface of the bone, and its extremity is not in the same plane as the extremity of the transverse diameter. The summit of the crest is, however, in the same plane.

Therefore, as the distance between the summits of the iliac crests varies with the form of the individual pelvis, and its extremities are in the same plane as those of the transverse diameter, it should be compared with the transverse diameter. My measurements established the fact that this is not to be ignored, for the difference is very great, and it must be remembered that the amount of error would be doubled, as it occurs on both sides of the pelvis.

If precaution is not taken against this, a small pelvis with a projecting outer lip would have, perhaps, nearly as large an intercrystal diameter as a large pelvis with a small outer lip. For example, a justo-minor pelvis when measured between the outer lips of the crests had an intercrystal diameter of 26.7 cm., a normal pelvis one of 27 cm., a difference of only 3 mm., whereas in reality the intercrystal diameter of the justo-minor pelvis was very nearly 1 cm. less than the normal one, 25.6 cm. and 26.5 cm. respectively. This point must therefore be commended to the notice of practitioners; and in measuring with the callipers the points must lie on the summits of the crests, and not along their outer edges.

Arrangement of the Pelves into Groups.—As I have stated, the pelves

are arranged in chronological order first of all. Leaving out the first 28, which were measured in the post-mortem room, and which I have already discussed, there remain 84 pelves of different individual characters. These 84 pelves are classified below. The first line gives the mean and average amounts over all the 84 pelves by which the half intercrystal differed from the transverse diameter, without reference to the direction of the deviation. The second gives the number of pelves out of these 84 in which the transverse exceeded half the intercrystal diameter, and the average and mean amounts of that excess. The third gives the number of pelves in which the two figures exactly agreed, and the fourth the number in which the transverse was less than half the intercrystal diameter, and the amount of that deficiency. (This arrangement I have also adopted in the table on p. 364.)

RELATION BETWEEN TRANSVERSE AND HALF INTERCRISTAL.

	No. of Cases.	Difference.	
		Mean.	Average.
In all the cases	84	3 mm.	4'9 mm.
Tr. greater than $\frac{1}{2}$ I.C.*	in 43 of these	4 mm.	6'5 mm.
Tr.† equal to $\frac{1}{2}$ I.C.	„ 10 „	—	—
Tr. less than $\frac{1}{2}$ I.C.	„ 31 „	3 mm.	4'3 mm.

A glance at the preceding table shows how close is the correspondence between the two. But we must go further and make a still more minute classification :

	No. of Cases.	Difference.		Extent of Difference.
		Mean.	Average.	
In all the cases	84	3 mm. or $\frac{1}{8}$ in.	4'9 mm. or $\frac{1}{5}$ in.	From Tr. greater than $\frac{1}{2}$ I.C.‡ by 2'35 cm. to Tr. less than $\frac{1}{2}$ I.C. by 1'7 cm. By 2'35 cm.
Tr. greater than $\frac{1}{2}$ intercrystal	in 1	—	—	By between 1 cm. and 2 cm.
Tr. greater than $\frac{1}{2}$ intercrystal	„ 7	1'15 cm. or $\frac{2}{5}$ in.	1'2 cm. or $\frac{2}{5}$ in.	By less than 1 cm.
Tr. greater than $\frac{1}{2}$ intercrystal	„ 35	0'4 cm. or $\frac{1}{8}$ in.	0'5 cm. or $\frac{1}{5}$ in.	—
Tr., equal to $\frac{1}{2}$ intercrystal	„ 10	—	—	By less than 1 cm.
Tr., less than $\frac{1}{2}$ intercrystal	„ 28	3 mm. or $\frac{1}{5}$ in.	3'4 mm. or $\frac{1}{5}$ in.	By between 1 cm. and 2 cm.
Tr., less than $\frac{1}{2}$ intercrystal	„ 3	1'15 cm. or $\frac{2}{5}$ in.	1'28 cm. or $\frac{2}{5}$ in.	

* $\frac{1}{2}$ I.C. abbreviation for half intercrystal.
† Tr. abbreviation for transverse diameter.
‡ $\frac{1}{2}$ I.C. abbreviation for half intercrystal diameter.

In all the 84 cases the difference between the transverse diameter of the brim and half the intercrystal diameter averaged only $\frac{1}{8}$ inch. The mean difference was $\frac{1}{8}$ inch. In 43 cases, or 51.3 per cent., the transverse diameter exceeded half the intercrystal by a mean of $\frac{1}{8}$ inch, an average of $\frac{1}{4}$ inch. In 10 cases, or 12 per cent., the transverse diameter exactly equalled half the intercrystal. In 31 cases, or 36.7 per cent., the transverse was less than half the intercrystal.

Analysis of Cases with Transverse greater than Half Intercrystal (51.3 per Cent.).—In the 43 cases, or 51.3 per cent. of all the cases, where the transverse exceeded half the intercrystal diameter, in only one case (a small, markedly rickety, flat pelvis) was it by $\frac{1}{2}$ inch. In this case the difference was $\frac{4}{7}$ inch. In 7 of the 43 cases, or about 17 per cent., it exceeded half the intercrystal diameter by a mean of $\frac{2}{5}$ inch, an average of $\frac{2}{5}$ inch. In 35 of the 43 cases, or about 80.5 per cent., it exceeded half the intercrystal diameter by a mean of $\frac{1}{8}$ inch, an average of $\frac{1}{8}$ inch.

Analysis of Cases with Transverse less than Half Intercrystal (36.7 per Cent.).—In the 31 cases, or 36.7 per cent. of all the cases, in which the transverse diameter of the brim was less than half the intercrystal, in 28 cases, or 90.3 per cent., the difference had a mean of $\frac{2}{15}$ inch, an average of $\frac{1}{7}$ inch.

In 3 cases the difference had a mean of $\frac{2}{5}$ inch and an average of $\frac{2}{5}$ inch.

If we examine into the class of cases that compose these groups, we find that the closeness of the agreement does not depend on the class of pelvis. For different pelves of the same shape agree in varying degrees with the general rule that half the intercrystal diameter equals the transverse diameter of the brim.

Having shown that in pelves taken at random there is a very fair degree of accuracy in estimating the transverse diameter of the brim, as equal to half the intercrystal diameter, it can be shown that in pelves grouped according to their individual peculiarities the same calculation gives the same accuracy.

Of the 84 pelves, 11 were classed as normal in configuration, and in these the difference between half the intercrystal diameter and the transverse averaged 4.5 mm. ($\frac{1}{8}$ inch); the mean difference was 3 mm. ($\frac{1}{4}$ inch). The transverse diameter of 5 of them exceeded half the intercrystal by 8 mm. ($\frac{1}{2}$ inch both mean and average), of 2 exactly equalled it, and of 4 was less than it by an average of 2.2 mm. ($\frac{1}{11}$ inch), a mean of 2.25 mm. ($\frac{1}{11}$ inch).

Large Pelves.—Pelves which are well shaped but abnormally large in size numbered 10. In these 10 pelves the mean difference be-

tween the transverse and half the intercrystal diameter was 3·2 mm. ($\frac{1}{8}$ inch); average difference 4·6 mm. ($\frac{1}{5}$ inch). Of these in 6 transverse diameter exceeded half the intercrystal by a mean of 7·5 mm. ($\frac{3}{10}$ inch), an average of 6 mm. ($\frac{1}{4}$ inch). In 1 the transverse diameter equalled half the intercrystal diameter exactly. In 3 the transverse was less than half the intercrystal by a mean of 1·5 mm. ($\frac{3}{50}$ inch), an average of 2·3 mm. ($\frac{1}{12}$ inch).

Justo-minor Pelves.—Justo-minor pelves numbered 5. In these 5 pelves the mean difference between the transverse and half the intercrystal diameter was 5 mm. ($\frac{1}{5}$ inch), and the average difference 3·8 mm. ($\frac{1}{6}$ inch). Of these, in 1 the transverse exceeded half the intercrystal diameter by 1·5 mm. ($\frac{3}{50}$ inch); in 4 the transverse was less than half the intercrystal diameter by a mean of 4·5 mm. ($\frac{1}{5}$ inch), and an average of 4 mm. ($\frac{1}{6}$ inch).

Funnel-shaped Pelves.—Funnel-shaped pelves numbered 11. In these 11 pelves the mean difference between transverse and half intercrystal diameter was 3 mm. ($\frac{1}{7}$ inch), an average of 3·8 mm. ($\frac{1}{6}$ inch). Of these, in 5 the transverse diameter exceeded half the intercrystal by a mean of 3 mm. ($\frac{1}{7}$ inch), an average of 4 mm. ($\frac{1}{6}$ inch). In 1 the transverse diameter equalled half the intercrystal exactly; in 5 the transverse was less than half the intercrystal by a mean of 2·5 mm. ($\frac{1}{5}$ inch), an average of 3·7 mm. ($\frac{1}{6}$ inch).

Obliquely-contracted Pelves.—Obliquely-contracted pelves numbered 12. In these the mean difference between the transverse and half the intercrystal diameter was 5 mm. ($\frac{1}{5}$ inch), the average 6·6 mm. ($\frac{3}{11}$ inch). Of these, in 8 the transverse exceeded half the intercrystal diameter by a mean of 6 mm. ($\frac{1}{4}$ inch), an average of 7 mm. ($\frac{1}{3}$ inch); in 1 the transverse diameter equalled half the intercrystal diameter; in 3 the transverse diameter was less than half the intercrystal by a mean of 4 mm. ($\frac{1}{6}$ inch), an average of 6·2 mm. ($\frac{1}{4}$ inch).

Transversely-contracted Pelves.—Pelves contracted in the transverse diameter numbered 3. One of these was a very small 'Roberts' pelvis. Here the transverse was less than half the intercrystal diameter by 1·7 cm., and was very small. In a second the difference was 6 mm., or $\frac{1}{4}$ inch, in favour of half the intercrystal diameter. In the third the two were equal.

Rickety Pelves.—Rickety pelves numbered 23, and included many varieties, some markedly, some only slightly, rickety, and all classes of shapes. In these the mean difference between the two measurements was 3·5 mm. ($\frac{1}{7}$ inch), the average 4·6 mm. ($\frac{1}{5}$ inch). Of these, in 14 the transverse exceeded half the intercrystal diameter by

a mean of 4 mm. ($\frac{1}{8}$ inch), an average of 5 mm. ($\frac{1}{4}$ inch). In 2 they were equal, and in 7 the transverse diameter was less than half the intercrystal by a mean of 2.5 mm. ($\frac{1}{10}$ inch), and an average of 4.5 mm. ($\frac{1}{4}$ inch).

Unclassified Pelves.—Pelves which were not classified numbered 9. In these the mean difference between the two measurements was 2.5 mm. ($\frac{1}{10}$ inch), the average difference 3 mm. ($\frac{1}{8}$ inch). Of these, in 4 the transverse diameter exceeded half the intercrystal by a mean of 2.5 mm. ($\frac{1}{10}$ inch), an average of 3.5 mm. ($\frac{1}{4}$ inch). In 2 they were equal, and in 3 the transverse was less than half the intercrystal diameter by a mean of 4 mm. ($\frac{1}{6}$ inch), an average of 3.8 mm. (about $\frac{1}{8}$ inch).

From the preceding facts it will be seen that in each class of pelves there are some in which the transverse diameter does not quite equal the half of the intercrystal, while in others it is more than equal to it, and in others, again, it is exactly equal to it. It is, however, quite certain that the variation from being exactly equal in the direction of either deficiency or excess is so slight as to scarcely disturb at all the value of the calculation, and for all practical purposes *we can perfectly well assume that the transverse diameter of the pelvic brim is to be got in any pelvis with fair accuracy by simply dividing the intercrystal diameter by two.* Any deviation is so slight that it may be disregarded.

I cannot qualify this assumption, that the variation is to be disregarded in any way, more especially if we compare in the lists of pelvic measurements the accuracy of this calculation with that by which the true conjugate is usually calculated. The transverse diameter varied in length from half the intercrystal by only a very few millimetres, or about $\frac{1}{8}$ inch. The true conjugate sticks no more closely to the rule of being $\frac{1}{2}$ inch less than the diagonal conjugate.

If in the 84 cases we make an average, it will be found that in them the difference between the conjugata vera and the conjugata diagonalis varied from being $\frac{1}{2}$ inch by an average of $\frac{1}{3}$ inch.

The following table, showing in each of the classes of pelves the closeness of the agreement with each of these rules, makes it evident that, if the general rule of subtraction of $\frac{1}{2}$ inch from the diagonal conjugate is a reliable method of calculating the length of the conjugata vera, subdivision of the intercrystal diameter by 2 is an equally reliable method of arriving at the length of the transverse diameter of the pelvic brim. This is so, even if we merely express their relative accuracy in figures; but it is very evident that the rule

Pelves.	No.	Transverse and Intercristal.				No.	Conjugata Vera and Conjugata Diagonalis.			
		1*	2	3	4		1	2	3	4
All the pelves ...	84	$\frac{1}{5}$	—	—	—	80	$\frac{1}{5}$	—	—	—
Of these in ...	43	—	$\frac{1}{4}$	—	—	44	—	$\frac{1}{4}$	—	—
	10	—	—	0	—	4	—	—	0	—
	31	—	—	—	$\frac{1}{8}$	32	—	—	—	$\frac{1}{7}$
Normal pelves ...	11	$\frac{1}{5}$	—	—	—	10	$\frac{1}{7}$	—	—	—
Of these in ...	5	—	$\frac{1}{3}$	—	—	3	—	$\frac{1}{8}$	—	—
	2	—	—	0	—	0	—	—	—	—
	4	—	—	—	$\frac{1}{11}$	7	—	—	—	$\frac{1}{10}$
Large pelves ...	10	$\frac{1}{5}$	—	—	—	10	$\frac{1}{7}$	—	—	—
Of these in ...	6	—	$\frac{1}{4}$	—	—	3	—	$\frac{1}{5}$	—	—
	1	—	—	0	—	1	—	—	0	—
	3	—	—	—	$\frac{1}{12}$	6	—	—	—	$\frac{1}{8}$
Justo-minor pelves ...	5	$\frac{1}{6}$	—	—	—	5	$\frac{1}{8}$	—	—	—
Of these in ...	1	—	$\frac{1}{50}$	—	—	1	—	$\frac{1}{50}$	—	—
	4	—	—	—	$\frac{1}{6}$	4	—	—	—	$\frac{1}{7}$
Funnel-shaped pelves ...	11	$\frac{1}{6}$	—	—	—	11	$\frac{1}{5}$	—	—	—
Of these in ...	5	—	$\frac{1}{6}$	—	—	7	—	$\frac{1}{4}$	—	—
	1	—	—	0	—	0	—	—	—	—
	5	—	—	—	$\frac{1}{6}$	4	—	—	—	$\frac{1}{10}$
Obliquely-contracted pelves	12	$\frac{3}{11}$	—	—	—	12	$\frac{1}{9}$	—	—	—
Of these in ...	8	—	$\frac{1}{3}$	—	—	9	—	$\frac{1}{6}$	—	—
	1	—	—	0	—	0	—	—	—	—
	3	—	—	—	$\frac{1}{4}$	3	—	—	—	$\frac{1}{8}$
Transversely-contracted pelves ...	3	—	—	—	—	2	$\frac{1}{8}$	—	—	—
Of these in ...	1	—	—	0	—	1	—	$\frac{1}{12}$	—	—
	1	—	—	—	$\frac{1}{4}$	1	—	—	—	$\frac{1}{7}$
Rickety pelves ...	23	$\frac{1}{5}$	—	—	—	22	$\frac{1}{4}$	—	—	—
Of these in ...	14	—	$\frac{1}{5}$	—	—	16	—	$\frac{1}{4}$	—	—
	2	—	—	0	—	1	—	—	0	—
	7	—	—	—	$\frac{1}{5}$	5	—	—	—	$\frac{1}{10}$
Unclassified pelves ...	9	$\frac{1}{8}$	—	—	—	8	$\frac{1}{8}$	—	—	—
Of these in ...	4	—	$\frac{1}{7}$	—	—	4	—	$\frac{1}{12}$	—	—
	2	—	—	0	—	2	—	—	—	—
	3	—	—	—	$\frac{1}{6}$	2	—	—	—	$\frac{1}{3}$

relating to the transverse diameter of the brim is really a much more accurate actual method of arriving at the length of it than that

* NOTE.—Figures are *inches*; *averages* are given.

Column 1, average variation from the rule over all the cases without reference to direction of variation.

Column 2, average excess—in the one case of the transverse over half intercristal, in the other of difference between the conjugates over $\frac{1}{2}$ inch.

Column 3, exact bearing out of rule.

Column 4, as in Column 2, but being average deficiency—*i.e.*, amount by which the transverse is less than half intercristal, or true conjugate less than $\frac{1}{2}$ inch less than diagonal conjugate.

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relating to the conjugata vera, because of the different methods of calculation.

The question now arises, Granted that this relation between the two diameters exists, why does it exist? It does not occur in the foetal pelvis, where there is very little pelvic cavity, most of the adult pelvic viscera being in the foetus abdominal; while, on the other hand, the false pelvis is expanded and flattened, and there is very little iliac fossa. In 10 foetal pelves of different ages the transverse diameter was less than half the intercristal, in 6 by nearly $\frac{1}{2}$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{3}$, $\frac{1}{5}$, and $\frac{3}{5}$ respectively, and in 4 by $2\frac{1}{2}$, $1\frac{2}{3}$, 5, and 3 times respectively its own length.

Again, in the pelvis of a human idiot of over thirty years of age, who never assumed the upright posture, it did not exist.

Therefore, it might be assumed that the relationship is due to forces working in extra-uterine life, and connected with the upright posture and ambulation, as it does not exist in the human foetus, nor in quadrupeds, nor in the case mentioned of the human idiot. From various considerations, I incline to think that it may exist in order to favour balancing of the body during walking, in order to minimize muscular effort, but all such ideas must necessarily be quite theoretical.