THE DIGESTIVITY OF THE HUMAN GASTRIC JUICE COMPARED TO THE DIGESTIVITY OF VARIOUS REMEDIES RECOMMENDED IN DISORDERS OF THE STOMACH.

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"THE stomach is not a test tube," has been said frequently as a warning to the fallacy of accepting in toto the finding of experiments as representing what actually takes place in the human stomach. It is also fair to state that these tests were not performed to prove any preconceived opinions, in fact I was somewhat surprised at the results. Further, adopting the caution of Mr. Mill, "To discriminate accurately between what we really do observe and what we only infer from the facts observed," I will consider first the experiments and the results, and then later some inferences that seem fair, probable and prominent.

After finishing a gastric analysis and finding the secretion normal I decided to compare its digestivity, as determined by its action on discs of coagulated egg-albumin, with the digestivity of some of the pharmaceutical preparations. The gastric secretions used throughout these experiments were obtained by giving the patients the routine test meal of bread and tea, waiting one hour, removing the gastric contents by the tube; the contents were then filtered, and the filtrate used in the tests.

It will be helpful to describe this first set of tests, although they were crudely performed; the results caused the later observations. Seven test tubes were used; in each were placed three discs of egg albumin and, with the exception of the last tube, a fl. 3 ss of the solution to be tested. The tubes with a thermometer were placed in a water bath and heated. I was unable to observe this series accurately, the tubes were not agitated, the temperature was maintained at about 130° F. for about four hours. In Table No. 1 will be found the contents of each tube, with the observations made at the end of four hours.

TABLE No. 1. TEST SERIES No. 1.

Tube No.	Contents.	Results.
I	Gastric juice. Patient A. S. Total acidity 72 or .26% Free H Cl 52 or .19%	Discs: approximately three-fourths digested. The remainder was very soft and transparent.
II	Ess. Pepsin (Fairchild). Alcohol 18.5% by vol.	Discs: no effect, firmer. Flocculent precipitate.
III	Ess Pepsin (N. F.). Pepsin. Wyeth. Rennin. Wyeth. Alcohol 5% by vol.	Discs: no effect, firmer. Flocculent precipitate.

Tube No.	Contents.	Results.
IV	Elixir Lactopeptin. (N. Y. P. Co.) Alcohol 19% by vol.	Discs: no effect, firmer, stained carmine. Flocculent precipitate.
V	Elix. Digest. Comp. (N. F.). Pepsin. Wyeth. Diastase. Wyeth. Pancreatin. Armour.	Discs: no effect, firmer, stained carmine. Flocculent precipitate.
VI	Pepsin (Wyeth) gr. xxx. Ac. hydrochl. dil. m. lxxx. Aq. distill. q. s. ad. fl. 3 i.	Disc: slight digestive effect. Flocculent precipitate.
VII	Ac. hydrochlor. (C. P.) gtt. v. Ess. Pepsin (Fairchild) fl. 3 ii.	Discs: surfaces slightly transparent, edges still preserved. Flocculent precipitate.

On observing these tubes I thought that the flocculent precipitates were caused by the digestion of the albumin, but on shaking the tubes the discs were observed as noted. I suspected, and the later tests proved, that these precipitates were caused by the heating.

The results were brought to the attention of a local druggist; he repeated some of the experiments, following generally the directions as given in the U. S. P. (1900) for the assay of pepsin. The tubes were kept in the water bath at 125° F. for two and a half hours, agitated every ten minutes. In these directions, it is stated that the egg should be immersed in boiling water for fifteen minutes, the albumin separated from the yolk and finely divided by passing it through a No. 40 sieve. I pointed out that if this were done, it would be impossible to decide the effect on the albumin on account of the precipitation caused by the heating, therefore discs were used. In each tube there were a fl. 3 ss of the solution and three albumin discs. The preparations tested and the results are appended

TABLE No. 2. TEST SERIES No. 2.

Tube No.	Contents.	Results.
I	Elix. Diges. Comp. (N. F.). Pepsin. Wyeth. Diastase. Wyeth. Pancreatin. Armour. Control.*	Discs: no effect, firmer, stained carmine. Flocculent precipitate. Precipitate.
II	Elix. Lactopeptin (N. Y. P. Co.). Alcohol 19% by vol. Control.	Discs: no effect, firmer, stained carmine. Flocculent precipitate. Precipitate.

* Controls, contained no discs, the tubes were not agitated and were kept in the water bath for one hour at 125° F. The tubes in this and the subsequent series were corked. The controls proved conclusively that the precipitates are caused by heating.

Tube No.	Contents.	Results.
III	Ess. Pepsin (Fair-child). Alcohol 18.5% by vol. Control.	Discs: no effect, firmer. Precipitate. Precipitate.
IV	Ess. Pepsin (N. F.). Pepsin. Wyeth. Rennin. Wyeth. Alcohol 5% by vol. Control.	Discs: no effect, firmer. Precipitate. Precipitate. Precipitate.
V	Pepsin (Wyeth) gr. xv. Ac. hydrochlor. dil. m. xl. Aq. distill. q. s. ad. fl. 3 ss. Control.	Discs: slight effect, softer. Precipitate. Precipitate.

I decided to test other preparations. Dr. Louis R. Wiley assisted me in Test Series No. 3. In each tube were placed a fl. 3 ss of the preparation and the albumin discs. All the tubes were kept in the water bath at 125° F. for three hours, and inverted twice every ten minutes.

TABLE NO. 3. TEST SERIES NO. 3.

Tube No.	Contents.	Results.
I	Liquid Pancreopepsin (Warner). Alcohol 10% by vol.	Discs: no effect, firmer. No precipitate.
II	Control.	No precipitate.
III	Elixir Peptenzyme (Reed and Carnrick). Alcohol 16.14% by vol.	Discs: no effect, firmer. Precipitate.
IV	Control.	Precipitate.
V	Ess. Caroid. (Mead, Johnson & Co.). Alcohol 12% by vol.	Discs: no effect, though softer. Precipitate.
VI	Control.	Precipitate.
VII	Elix. Lactated Pepsin (P. D. Co.). Alcohol 15% by vol.	Discs: no effect, firmer, stained carmine. Precipitate.
VIII	Control.	Precipitate.

On reflection, I realized that if any comparisons were to be made between the digestivity of the gastric juice and of these preparations, the conditions present in the human stomach should be imitated as far as possible. I found in Beaumont's classical work, that the range of the temperature of the stomach under all conditions was between 98° F. and 103° F. Howell states that the optimum temperature of pepsin ranges between 98.6° F. and 104° F., and that exposure to 176° F. results in the inactivation of the pepsin. In my future experiments I therefore decided to keep the water bath between 100° F. and 104° F. These remedies act in the human

stomach as does the gastric juice, therefore when they are compared in tests outside of the body, it should be done at the temperature of the human stomach (98° F.-103° F.) and not at 125° F. To imitate the peristalsis, the tubes were inverted twice every ten minutes. The coagulated egg-albumin was prepared as follows: the egg was placed in boiling water for five minutes and then transferred to cold water.

In considering the following experiments it must be remembered that though the stomach is not a test tube, it is also true that the gastric juice is not accustomed to working in a test tube; and be it also remembered that these remedies, with one exception, are manufactured products—we may say made in test tubes—so that the element of artificiality could be considered to favor the remedies. Be that as it may, the gastric juice and the remedies were under the same normal conditions, in similar amounts (fl. 3 ss), and the amount of albumin was always the same (10 grains). Dr. H. C. Wood, Jr., suggested to Dr. Wiley that a weighed amount of albumin should be used, and the weight noted at the end of the test. The albumin was cut into small blocks; it required two or three blocks to weigh 10 grains. This shape gives the observer a better opportunity to detect any digestive effect. It is more probable that the stomach receives an egg in this form than if passed through a No. 40 sieve. Beaumont also states that soft-boiled eggs are digested in the stomach in three hours, whereas it took about six and a half hours for the gastric juice to digest soft boiled eggs in a vial kept at 100° F. with frequent agitation. Therefore the conditions of the later tests are as follows: the water bath was kept between 100° F. and 104° F. for six hours, each tube contained a fl. 3 ss of the solution with ten grains of the coagulated egg albumin, the tubes were inverted twice every ten minutes. The following tests were then performed:—

TABLE NO. 4. TEST SERIES NO. 4.

Tube No.	Contents.	Results.
I	Gastric juice, patient M. K. Total acidity 62 or .21%. Free H Cl 34 or .12%	Blocks: entirely dissolved. Slightly cloudy.
II	Artificial gastric juice Ac. hydrochlor. .2%. Pepsin (Armour). .3%. Aq. distill. q. s.	Blocks: slightly rounded, very slightly firmer. 8½ grains.
III	Elixir Lactated Pepsin (P. D. Co.). Alcohol 15% by vol.	Blocks: no effect, edges unchanged, firmer, stained carmine. Slightly cloudy. 7½ gr.
IV	Same + .2% H Cl.	Blocks: edges slightly rounded, firmer, stained carmine. Cloudy. 9 grains.

Tube No.	Contents.	Results.	Tube No.	Contents.	Results.
V	Liquid Pancreo- psin (Warner). Alcohol 10% by vol.	Blocks: no effect, edges unchanged, firmer. Clear. 9½ grains.	XVIII	Ess. Pepsin (new formula). Pepsin. Armour. Rennin. Wyeth. Alcohol 20% by vol.	Blocks: edges slight- ly rounded, sur- faces sticky, firm- er. Cloudy. 7½ grains.
VI	Same + .2% H Cl.	Blocks: very slight, if any effect, edges unchanged, firmer. Clear. 9½ grains.	XIX	Same + .2% H Cl.	Blocks: edges round- ed, surfaces sticky, slightly firmer. Cloudy. 7 grains.
VII	Ess. of Caroid (Mead, Johnson & Co.). Alcohol 12% by vol.	Blocks: edges slight- ly rounded, very slightly if any firmer. Cloudy. 7 grs.	XX	Ess. Pepsin (Fair- child). Alcohol 18.5% by vol.	Blocks: edges very slightly rounded, surfaces not sticky, firmer. Cloudy. 7 grains.
VIII	Same + .2% H Cl. Slight precipitate be- fore test.	Blocks: edges sharp, slightly firmer. Cloudy. 8 grains.	XXI	Same + .2% H Cl.	Blocks: edges slight- ly more rounded than No. XX, sur- faces slightly sticky, firmer. Cloudy. 7 grains.
IX	Elix. Digest. Comp. (N. F.). Pepsin. Wyeth. Diastase. Wyeth. Pancreatin. Armour.	Blocks: no effect, edges sharp, firm- er, stained car- mine. Cloudy. 7 grains.	XXII	Ess. Pepsin (R. S. & Co.). Pepsin. Armour. Contains .12% H Cl. Alcohol 18% by vol.	Blocks: edges fairly rounded, surfaces barley sticky, firm- er. Cloudy. 7 grains.
X	Same + .2% H Cl.	Blocks: edges slight- ly rounded, firmer, stained carmine, surfaces smeary and sticky. Cloudy. 8½ grs.	XXIII	Ess. Pepsin (R. S. & Co.). % H Cl. increased to .2%. Pepsin. Armour. Alcohol 18% by vol.	Blocks: edges slight- ly rounded, more so than No. XXII, surfaces sticky, firmer but not as marked as No. XXII. Cloudy. 7½ grains.
XI	Elixir Peptenzyme (Reed & Carn- rick). Alcohol 16.14% by vol.	Blocks: no effect, edges sharp, firm- er. Cloudy. 7 grs.	<p>In Test Series No. 4 I was assisted by W. W. Nofer, P.D.</p> <p>In this series it was suggested that the addition of .2% HCl would increase the digestivity of the various preparations. This addition was made, as indicated in the series; it will be noticed that the addition probably was futile. Where there was any marked change, the blocks were heavier.</p> <p>In considering Test Series No. 4 it is noticeable, that though the albumin does not show any great digestive effect, they all show some loss of weight. To demonstrate if the alcohol present in the various preparations was responsible, Test Series No. 5 was conducted. The arrangements were identical with Test Series No. 4.</p>		
XII	Same + .2% H Cl.	Blocks: no effect, firmer, edges un- changed. Cloudy. 9½ grains.			
XIII	Ess. Pepsin (N. F.). Pepsin. Wyeth. Rennin. Wyeth. Alcohol 5% by vol.	Blocks: edges very slightly rounded, surfaces slightly sticky, firmer. Cloudy. 6¾ grs.	<p>TABLE No. 5. TEST SERIES No. 5.</p>		
XIV	Same + .2% H Cl.	Blocks: edges round- ed more so than in No. XIII., surfaces more smeary than No. XIII, firmer not as marked as No. XIII. Cloudy. 6½ grains.			
XV	Elix. Lactopeptin (N. Y. P. Co.). Alcohol 19% by vol.	Blocks: edges very slightly rounded, surfaces slightly smeary, firmer, stained carmine. Cloudy. 7½ grs.	Tube No.	Contents.	Results.
XVI	Same + .2% H Cl.	Blocks: edges very slightly rounded, surfaces slightly sticky, firmer, stained carmine. Cloudy. 9½ grs.	I	Gastric juice. Pa- tient H. W. V. Total acidity 54 or .19%. Free H Cl. 50 or .18%.	Blocks: digested in 4 hrs. 40 min.
XVII	Ess. Pepsin (Lilly). Alcohol 17% by vol.	Blocks: edges slight- ly rounded, sur- faces sticky, firm- er. Cloudy. 7½ grains.			

Tube No.	Contents.	Results.
II	Gastric juice fl. 3 iiiss. Alcohol fl. 3 ss.	Blocks: edges rounded and softened showing decided digestive effect, softer. On account of the softness of the albumin, all the pieces could not be weighed, the loss however, being only $\frac{1}{2}$ or $\frac{3}{4}$ grains. Cloudy. $6\frac{1}{4}$ grs.
III	Gastric juice fl. 3 iii. Alcohol fl. 3 i.	Blocks: surfaces sticky, edges rounded showing some digestive effect, slightly firmer. Cloudy. $8\frac{3}{4}$ grs.
IV	Distilled water.	Blocks: no effect, swollen appearance, some small pieces of albumin broken off by inverting, the loss about $\frac{1}{2}$ grain. Clear. 16 grains.
V	Distilled water fl. 3 iiiss. Alcohol fl. 3 ss.	Blocks: swollen appearance, no effect. Clear. $16\frac{3}{4}$ grs.
VI	Distilled water fl. 3 iii. Alcohol fl. 3 i.	Blocks: no effect, swollen. Clear. 16 grains.
VII	Pepsin (scale) Ray Chem. Co. .3% sol. distilled water.	Blocks; no effect, edges unchanged, slightly firmer. Cloudy. 8 or 9 grains. Record not definite.
VIII	.3% pepsin sol. fl. 3 iiiss. (Ray Chem. Co.). Alcohol fl. 3 ss.	Blocks: no effect, edges unchanged, firmer. Cloudy. $8\frac{3}{4}$ grains.
IX	.3% pepsin sol. fl. 3 iii. (Ray Chem. Co.). Alcohol fl. 3 i.	Blocks: no effect, edges unchanged, firmer. Cloudy. $9\frac{1}{2}$ grains.
X	Pepsin (scale) (Ray Chem. Co.) gr. xv. Distilled water fl. 3 ss.	Blocks: edges rounded, surfaces moderately sticky, may be slightly firmer. Cloudy. $4\frac{1}{4}$ grs.
XI	Pepsin (scale) gr. xiii $\frac{1}{8}$. (Ray Chem. Co.). Distilled water fl. 3 iiiss. Alcohol fl. 3 ss.	Blocks: surfaces sticky, edges rounded, slightly firmer. Cloudy. $5\frac{1}{4}$ grains.
XII	Pepsin (scale) gr. xi $\frac{1}{4}$. (Ray Chem. Co.) Distilled water fl. 3 iii. Alcohol fl. 3 i.	Blocks: edges somewhat rounded, surfaces slightly sticky, firmer. Cloudy. $6\frac{1}{2}$ grs.
XIII	Hepptine. Lab. of Applied Physiology.	Blocks: no effect, edges unchanged, surfaces not sticky, firmer. Cloudy. $7\frac{3}{4}$ grs.

From Series No. 5 we note that alcohol when added to distilled water does not interfere with the absorption of water by the coagulated egg-albumin, nor cause any loss of weight, Tubes No. iv, v and vi.

It was suggested that the pharmaceutical preparations would have displayed greater proteolytic power if they had been diluted. We see by Test Series No. 4 and No. 5 that the various preparations caused a loss of weight without the blocks showing any gross change indicative of digestive effect. To demonstrate, if the loss of weight is really due to a digestive action, it would be necessary to test the various solutions at the end of the test for the products of digestion,—for peptones, or it would be easier to inactivate the enzymic content by previously boiling the preparation, then testing it, for if there were any loss of weight of the albumin it would be due to physical or chemical action, and not due to enzymic activity. To study the effect of dilution and of heating, together with some other tests, Test Series No. 6 was performed under the same arrangements as Series No. 4 and 5.

TABLE No. 6. TEST SERIES No. 6.

Tube No.	Contents.	Results.
I	Ess. Pepsin (Fairchild). Alcohol 18.5% by vol.	Blocks: no effect, edges unchanged, surfaces very slightly sticky, firmer. Cloudy. 7 grains.
II	Ess. Pepsin (Fairchild). <i>Boiled for one minute.</i> Cloudy, marked flocculent precipitate.	Blocks: no effect, edges unchanged, firmer, surfaces no change. Cloudy. $7\frac{1}{4}$ grs.
III	Ess. Pepsin (Fairchild). 4% aqueous solution.	Blocks: no effect, edges unchanged, surfaces not sticky, no change in consistency, appear slightly puffed. Slightly cloudy. Some small pieces broken off. $11\frac{1}{2}$ grs.
IV	Ess. Pepsin (Fairchild). 4% aqueous solution. <i>Boiled for one minute.</i> Slightly cloudy and opalescent.	Blocks: same as No. III. Cloudy. Some small pieces lost. $10\frac{3}{4}$ grains.
V	.2% H Cl.	Blocks: no effect, edges unchanged, puffed, less opaque, softer. Clear. Some small pieces lost. 16 grains.

VI	Ac. H Cl. Dil. M. xl. Distilled water q. s. fl. 3 ss.	Blocks: no effect, edges unchanged, soft, slightly puffed, slightly less opaque. Clear. Some small pieces lost. 10½ grains.
VII	Pepsin (scale) gr. xv. (Ray Chem. Co.). Distilled water fl. 3 ss. Yellow tinge, slight- ly cloudy.	Blocks: edges round- ed, surfaces smeary, same con- sistency or slightly softer. Cloudy. 3¾ grains.
VIII	Pepsin (scale) gr. xv. (Ray Chem. Co.) .2% H Cl sol. q. s. fl. 3 ss. Yellow tinge, slight- ly cloudy.	Blocks: edges round- ed, surfaces smeary, same con- sistency or slight- ly softer. Cloudy. 2½ grs.

These are the experiments. I believe that they were accurately performed as described, the results carefully noted. They represent what was observed.

Bear in mind the object of these tests, as indicated in the title. It is practically impossible to make these comparisons except as has been done. If we were to introduce into the stomach any of these preparations to observe its activity, how could we separate the action of the gastric juice which would be present and acting? It is not an assay of pepsin; it is to determine the clinical value of these preparations as they are placed in the physician's hands. When these remedies are prescribed the patients do not use them in a manner similar to the method of assaying pepsin (U. S. P.). It may be emphasized that only 10 grains of albumin were used in each fluid half ounce.

What are some of the valid inferences that may be drawn from these results? Undoubtedly the most striking is that normal gastric juice has shown the greatest proteolytic power. Therefore, when there is a deficiency of the gastric juice, we should endeavor to re-establish the production of normal gastric juice, before replacing it by these various remedies. In Test Series No. 5, we see that the gastric juice which had entirely digested the albumin in Tube No. i had its activity retarded by the addition of alcohol, for in Tube No. ii, with a fl. 3 ss alcohol there remained 6¼ grs. of albumin and in Tube No. iii, with fl. 3 i alcohol, there remained 8¾ grs. Although this does not prove that alcohol does not increase the quantity of the gastric juice, it does prove that alcohol *per se* does interfere with digestion. It may be fairly admitted that alcohol by increasing the total quantity of gastric juice by its direct and indirect stimulating effect overcomes the interference that its presence causes. When a well person requires alcohol to complete his digestion, he is probably committing some error in diet. When

a patient presents some deficiency of digestion the indications will, in a large proportion of cases, be better met by presenting to the stomach some easily digested food efficiently prepared from fresh products than by stimulating the impaired mucosa to greater effort by the administration of alcohol. I am not one that believes that alcohol has no place in the armamentarium of the physician; in my experience there are some indications that are best met by alcohol. The temperance question and the question of alcohol as a food are not before us. We see by Test Series No. 5 that the albumin under the conditions of the test, probably absorbs water, for the albumin was six grains heavier at the end of the test, Tube No. iv. Hepptine, Series No. 5, Tube No. xiii, described as "the pure gastric juice of living pigs," was kindly furnished by the Laboratories of Applied Physiology. In their literature, it is stated, "The juice does more than merely digest the food found in the stomach into which it is introduced—re-establishes its normal secretion, a function which is not performed by any pepsin or preparation of pepsin". . . "is not intended to act directly upon the food, consequently its therapeutic value cannot be computed by the ordinary test tube method, it not being an artificial digestive." Considering the source of Hepptine, I thought that in these tests it would approach the activity of the gastric juice. It showed practically no digestive effect. I have never used Hepptine and cannot speak of its clinical value.

In Test Series No. 6 we see that ess. pepsin (Fairchild), as far as the final results are concerned, was not affected by boiling, Tube No. ii. From this the conclusion seems probable that the loss of weight in Tube No. ii is not due to enzymic action but to some undetermined physical or chemical action, for physiologists state that pepsin in solution is inactivated by heating to 176° F., the ess. pepsin (Fairchild) was boiled actively for one full minute. Before the final word is said on this point the test should be repeated, tests should be made to determine the boiling point of ess. pepsin (Fairchild), and also to determine if there are present in the essence any substances which protect the pepsin content from the inactivating effect of the boiling. On account of the presence of the alcohol, it would be well to test an essence of pepsin that had been subjected to a temperature of 212° F. in a closed container. Dilution of ess. pepsin (Fairchild) did not favorably affect it; the boiled specimen here also gave the same result, Tubes No. iii and No. iv.

Hydrochloric acid in the proportion of .2% did not affect the absorption of water by the albumin, Tube No. iv, whereas the proportion of 1.6% checked the absorption, for the albumin weighed only a half grain more, Tube No. vi. What boiled and diluted specimens of the other preparations would do, can only be determined by performing the tests. It cannot be inferred in any way that the pepsin used in the prepara-

tion of these various products is inert, perhaps it is inactivated or its activity greatly retarded by the various menstrua. We see that scale pepsin, 15 grs. to a fl. 3ss of distilled water, reduced the albumin to $4\frac{1}{4}$ grs. (Test Series No. 5, Tube No. x), and to $3\frac{3}{4}$ grs. (Test Series No. 6, Tube No. vii). Scale pepsin in the proportion of .3% (as found in the gastric juice) did not exert any great effect, the albumin weighed 8 or 9 grs. (Test Series No. 5, Tube No. viii). The reader may make other deductions by studying and comparing the tables. The first three series demonstrated as far as visible results could be judged, that the higher temperature of 125° F. did not cause any greater digestive effect than did the temperature of 100° F. to 104° F.

Many other tests could be performed along these lines, for instance, comparison of the various makes of scale pepsin; comparison of the effect of the same preparation on albumin boiled for different periods of time, as ten, fifteen, twenty or thirty minutes; dried albumin might be used; indicators other than egg albumin could be employed; rocking water-bath might be constructed to represent continuous peristalsis.

A practical inference suggests that when we prescribe pepsin we will probably get better results by ordering scale pepsin dispensed as a tablet, capsule, or in sealed packages, to be freshly dissolved in water and taken about a half hour after meals. If hydrochloric acid is indicated it may be dispensed separately and ordered to be taken well diluted. (All the scale pepsin solutions were freshly made at the time of the tests.)

Undoubtedly pepsin, like other remedies, has suffered from being improperly dispensed and injudiciously used. Pepsin will not lift a fallen stomach; it will not cure the reflex gastric symptoms due to gall-bladder disease, chronic appendicitis, etc. The crux of the whole subject depends upon that fascinating subject of diagnosis. My personal impressions are that pepsin's rôle in therapeutics will be established and enhanced by its exhibition on exact indications dependent on accurate diagnosis.

ON SO-CALLED BINASAL HEMIANOPSIA IN BRAIN TUMOR.

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THE third paper by Cushing and Walker¹ in their series on distortions of the visual fields in cases of brain tumor is devoted to binasal hemianopsia. The authors detail the histories of a dozen cases with many charts of the fields of vision and reach several conclusions which are of sufficient importance to warrant discussion, the more so as any hypothesis backed by such

authoritative writers, the one unsurpassed in the field of cerebral surgery, the other unsurpassed in the field of perimetry, cannot fail to carry great weight.

Quoting from their paper (p. 597):—

"A constriction of the field of vision due to a destruction of fibres more complete from the temporal than from the nasal half of the retina and justifying the designation of nasal hemianopsia has been observed in from 5 to 6% of a series of 500 cases of brain tumor." . . . "It is difficult or impossible to attribute the ultimate binasal blindness to a lesion confined alone to the nerve and retina. Another factor must come into play, which elsewhere in the course of the nerve affects the uncrossed fasciculus from the temporal retina more markedly than the crossed fibres from the nasal retina. We wish to suggest that this may be due to pressure of the dilated [third] ventricle, which forces the exposed nerves or tracts adjoining the chiasm downward and outward against the resistant carotid vessels, which transversely indent the outer aspect of the nerves. In this way the uncrossed fasciculi to the temporal retinae, and the laterally placed macular bundle as well, suffer from a mechanical pressure 'block' in addition to the diffuse anatomical destruction of fibres throughout the nerve in consequence of the contraction of the new tissue formation in the long-standing choked disk."

The two points to be discussed are these: the occurrence of binasal hemianopsia and its explanation.

The question of the occurrence of binasal hemianopsia is a question of definition. It is not easy to give a satisfactory brief definition. The three things to be emphasized are: first, the loss should be limited to corresponding *half fields*; second, the loss should be symmetrically distributed in the two eyes; third, the cause should be a lesion to the visual centres or paths at or posterior to the chiasm, for the fundamental anatomical fact at the foundation of the idea of hemianopsia is the semidecussation of the optic nerves. Cases are not uncommon where we get fields not unlike in extent and distribution those classified as true hemianopsia, but of wholly different origin, for example, in chronic glaucoma and in retinal or choroidal lesions symmetrically disposed in the two eyes. These should not be classed as cases of true hemianopsia. They might be called *pseudo-hemianopsia*. That the authors had some such conception of true hemianopsia as above outlined would appear from a statement which I quote from the first paper in this series²:—

"Thus in considering the prevalence of true hemianopsia in a given series of intracranial tumors, one should exclude from the list the subtentorial lesions which are barred from the possibility of *direct implication of the optic tract and radiations*."

To be sure, most of the cases described in the present paper are subtentorial tumors, but this inconsistency is explained when we recall that the purpose of the paper is to show how such tu-