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# Hyperemesis gravidarum : its etiology and treatment

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# HYPERREMESIS GRAVIDARUM

## Its Etiology and Treatment

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"The writer does the most who gives his reader the most facts and takes from him the least time."

-Sidney Smith

## ETIOLOGY

Abnormality in carbohydrate metabolism has been a favorite theory for the cause of hyperemesis gravidarum for the past twenty years. Dr. Paul Titus (83) claims priority for this theory as well as priority for the use of intravenous glucose in therapy of this condition. Contrary to many of the theories of the etiology of early vomiting of pregnancy, Titus bases his theory on sound reasoning and proven scientific facts. To state his case: in the first place it is a commonly known fact that the liver is always affected in fatal cases of pernicious vomiting. It has been proven that the liver is the storage place for sugar or glycogen and acts as a great detoxifier of the blood stream. The liver functions less powerfully in the latter effect as its stores of glycogen are depleted. To illustrate this; animals starved of carbohydrate may be killed with smaller doses of poison than normally fed animals. Thus starved animals are more susceptible to liver damage from carbon tetrachloride and other poisons whose detoxification in the body depends on a normal liver function. In the pregnant woman the pregnant state causes an increased demand for carbohydrate because experiments have shown that the fetal tissues are synthesized for the most

part from glycogen - that is, the nutritive exchange at the placental site is almost entirely in the form of glycogen.

Clinical studies by Titus and Dodds (84) have shown that the blood sugar levels in cases of pernicious vomiting are subject to wide fluctuations, and that the attacks follow periods of what they have termed "relative hypoglycemia". These hypoglycemic levels attained in hyperemesis gravidarum, if compared to similar values obtained even more rapidly in insulin overdosages, would be expected to cause convulsive seizures of one type or another. Animals starved on a carbohydrate free diet are especially susceptible to attacks of vomiting. (43) This is due to increased excitability of the vomiting center which lies in the medulla - the excitability being increased by the metobolic disturbance. Thus the mother when depleted of carbohydrates is especially liable to attacks of vomiting and this vomiting further limits her carbohydrate intake. Meanwhile the fetus is demanding glycogen as usual and a third factor is involved in the depletion of this important item. The mother when depleted is more susceptible to toxins from any source and liver damage results and a vicious circle is established which unless interrupted somewhere along the line results in

the death of the mother and fetus. Many other authors believe that this is the cause of early vomiting of pregnancy and conduct their treatment accordingly. (9), (11), (17),(38), (67), (81), (56).

Thalhimer (80) sees no reason for bringing in the possibility of unknown toxins in the body to aid in accounting for this condition. He advances the following reasons for this belief: Some theories suggest a toxic cause but in spite of an enormous amount of investigation no such toxin or toxins have been found. Thalhimer contends that the patients would look toxic if they were toxic and asks the question "Do they?" He states that if one knew nothing at all about the hypoglycemic reaction from insulin and saw a patient in insulin shock, he would regard that patient as suffering from a toxemia, and he might even class it as an eclampsia or as a so-called nephritic toxemia of pregnancy. Yet as is readily understood, the condition in insulin shock is not a toxemia but merely a speeding up of the normal metabolic process. Such a condition might easily be brought about in pregnancy by the threefold action of decreased intake of carbohydrates, increased metabolism and loss through pernicious vomiting.

The one fact that seems to throw a shadow of doubt

on this theory is: if this is a purely metabolic phenomenon, why does termination of the pregnancy have such a profound and immediate effect on the condition? The answer to this is, first, interruption of the pregnancy if delayed too long doesn't have this effect on the condition which rapidly progresses to a fatal termination, and second, the presence of the glycogen starved fetus in the maternal organism forms a strong link in the cycle; which link when removed permits the interruption of the cycle and the return to normal of the body glycogen in the mother.

Another question which may be directed at this theory of etiology is: Why does the condition usually appear about the fifth to sixth week of pregnancy and why does it last only thru the sixth to eighth week? The first part of the question may be answered by stating that it is not until the fetus has attained a size which requires a considerable amount of glycogen to continue growth that the mother's store of glycogen is depleted - this point evidently being reached at about the 5-6 week. As to why the vomiting ceases at around the 6-8 week, perhaps it is because in the mild cases the mother is driven by a craving for sweets and a general high carbohydrate diet so that the glycogen is increased

to the point where vomiting ceases - if this change in diet does not occur the vomiting doesn't cease and the problem becomes evident to the doctor.

Somewhat paralleling the carbohydrate depletion theory with resulting acidosis, de Wesselow and Wyatt (24) believe that the depletion in the alkaline reserve is a factor leading to the acidotic condition. Losee and Van Slyke (52) have shown that even in normal pregnancy a slight acidosis is present, the plasma carbon dioxide falling from an average figure of sixty five percent to 55.6 percent during pregnancy. Thus with the usual slight diminution in alkaline reserve of the blood during pregnancy another barrier to acidosis is weakened and once vomiting is begun, the further depletion of the reserve adds to the acidosis.

Since the seat of the trouble in any type of vomiting appears to be the stomach at first thought, many theories of pernicious vomiting name this organ or the nearby gastrointestinal tract as the cause of this condition.

Allen (2) concluded that some type of neurotic condition initiates the onset of early vomiting of pregnancy and that the vomiting and consequent lack of food in the stomach cause an irritation of the nerve endings in the mucous lining of the stomach leading to a continuance of the vomiting. He then says that the ensueing starvation

and exhaustion of the glycogen reserve leads to the final toxic condition.

Adair (1) in his book on Obstetrics states that he believes the vomiting to be a reflex phenomenon accompanying the increased irritability of the gastrointestinal tract which occurs during pregnancy, causing reversal of peristalsis or increased peristalsis with marked contraction rings moving against a closed pylorus.

McGowan et al confirm this (54). This group of workers took X-rays of a series of cases and found twelve of them showing spasm of the second portion of the duodenum. They believed this to be the cause of the vomiting in this type of hyperemesis. They theroized the duodenal spasm to be the result of an abnormal reaction to some hormone of the the type that causes contraction of one muscle with one type of nerve supply and relaxation of one muscle with another nerve supply; i.e., spasm of cervix and relaxation of the uterus, spasm of trigone and relaxation of ureters, spasm of second portion of duodenum and relaxation of the pylorus and possibly of stomach. When this mechanism becomes exaggerated in some areas complications ensue - such as vomiting.

Miller treats his patients with the idea in mind that pylorospasm is the reason for the nausea and vomiting.(58)

Another theory involving the stomach in pernicious vomiting of pregnancy takes into account the often found decrease in hydrochloric acid in the emesis of pregnancy. Arzt (5) has made an extensive study of the gastric contents in pregnancy and has reached the conclusion that both free and total acids in the stomach are lower during pregnancy than in the nonpregnant state. He states that this deficiency is most marked early in the pregnancy when nausea and vomiting are most common. Arzt thinks this low acidity is due to regurgitation of the alkaline duodenal contents into the stomach thus tending to agree with those workers who believe that reversed intestinal gradient is a factor in the vomiting. This work is confirmed by Anderson. (3).

The latter studied a series of twenty-eight patients with the normal nausea and vomiting of pregnancy and found that six of this number had achlorhydria. Of twenty-two patients studied who had hyperemesis gravidarum, only ten had achlorhydria while three of them had hyperchlorhydria but just as severe symptoms. The remainder showed varying degrees of free acid. He thus found that achlorhydria appeared in thirty-two percent of his series of patients studied.

Mussey(62) keeps in mind that patients exhibiting

pernicious vomiting may be either achlorhydric or hyperchlorhydric and after running gastric analysis he treats them accordingly believing that either deviation from the normal may be a factor in causing this condition.

Another type of deficiency has been thought by some authors to have an important bearing on hyperemesis. Oliver (66) refers to the demand made upon the maternal organism by the embryonic tissues for phosphorus and calcium. These demands according to Oliver greatly exceed the demand of the normal adult and unless the mother has access in her diet to a sufficient amount of these minerals, there is an insufficient amount in her blood and she suffers the effects.

Holman (43) also believes that the maternal organism suffers from a calcium deficiency during pregnancy, but he arrived at his conclusions in a slightly different way. He reviewed the literature and noted that there is little evidence of hyeremesis gravidarum among the aboriginals and believed that this was so because the so-called uncivilized people were more exposed to sunlight throughout their pregnancies and thus maintained a sufficient calcium metabolism to take care of their increased needs at this time.

Drennan (26) agrees with Oliver in the fact that the fetus makes great demands upon the mother for calcium during pregnancy, but he carries the process to a logical conclusion. He states that it is generally believed that a certain amount of fatty infiltration of the liver cells around the hepatic veins is a physiological condition during pregnancy, but also states that he doesn't believe that this fatty infiltration is physiological. He believes that this is a pathological condition due to the absorbtion of calcium salts from the maternal blood by the fetus in amounts large enough to deprive the mother of that which is necessary to unite with the fatty matter in her liver cells to form lipoids or soluble fats. Normally these fats would then be conveyed by the blood stream and deposited in the fat depots in her tissues or kept as a source of fat for the fetus. Finally, because of this fatty infiltration in the liver cells, protein digestion cannot continue as usual and toxins are produced which add to the condition and produce a true toxemia.

Thus the liver is unable to continue its normal function, detoxification power is reduced, and again a vicious cycle is set up which must be broken if recovery is to be brought about.

Stander (73), after accumulating a large amount of

data from clinical experiments, concludes that lowering of the blood calcium is not a consistent finding in this condition and that any beneficial effect of calcium thereapy in the intoxication of pregnancy must have an influence aside from restoring the blood calcium level to normal.

It has been proven that relationships do exist between disturbances in calcium metabolism and carbohydrate metabolism. Minot and Cutler (59) found that hypoglycemia associated with liver damage produced by carbon tetrachloride poisoning was relieved by the administration of calcium. Underhill and Blatherwick (87) proved that the hypoglycemia following parathyroidectomy was corrected by the administration of calcium.

In neither of these two instances of hypoglycemia was there evidence of a decreased blood calcium level during the toxic states. Thus the parathyroid hormone might be intimately tied up with the etiology of nausea and vomiting of pregnancy even though the blood clacium level were found to be normal.

While I have included the possibility of foci of infection as a possible cause of hyperemesis gravidarum, strictly speaking it should not be found here. As a rule the foci of infection, while causing vomiting and the

progressive symptoms, signs and findings of the true vomiting of early pregnancy, in all probability would cause the same course in the patient were there no pregnancy present. However, since these conditions do complicate the picture of the early period of pregnancy they cannot be justly ignored.

DeLee (21) in his classification of the causes of vomiting of pregnancy includes those in which the vomiting is due to some other cause than the pregnancy. e.g., appendicitis, ulcers, gall-stones, etc.

Allen (2) states that "Focal infections, by lowering the resistance of the patient and the continuous absorbtion of toxins, may be considered as a possible cause, and every method should be used to locate and remove the foci. However, in a large percentage of my patients I have been unable to find any definite foci of infection". This sums the case up quite well.

Cornell (14) also places foci of infection in the place of differential diagnoses which must be considered, rather than in the place of possible causes of hyperemesis gravidarum.

Talbot (18) however, contends that the fundamental cause of the condition should be sought in foci of infection around the teeth rather than in the products of

infection. He states that he is forced to this conclusion by the findings shown in X-ray examinations of ninety-seven cases of toxemia which came under his observation. Every case in this series showed chronic sepsis involving the dental structures.

Still another theory of the etiology of pernicious vomiting involves the kidneys and urinary tract. Following the foci of infection idea Keeton (45) emphasizes that, in the average case of early pregnancy, changes take place in the pelves of the kidneys and ureters causing reflex stimulation of the vomiting mechanism. It is a well known fact that nausea and vomiting are familiar symptoms in Dietl's crises. Thus if during the course of a normal pregnancy a chromic focus of infection exists in the urinary tract, then the tract will reflexly stimulate the vomiting center and cause hyperemesis.

Fischer (29) calls attention to the prevalence of clinical and subclinical nephritis during pregnancy. Many factors tend to aggravate this condition. Among these are the vomiting caused by the condition and the starvation attendent upon the absurd dietary restrictions to which the patients are so often subjected. Thus a cycle is set up which tends to progress unless checked.

Bugbee (10) also calls attention to the prevalence of renal infections in association with abnormalities of pregnancy. He believes the process is hematogenous in a large number of cases, originating in the colon. One of the most important factors, according to him, is the interference with drainage from the kidney due to the pressure on the ureters from the enlarging uterus, especially on the right side; or due to twisting or tension on the ureter. Since all the conditions of the urinary tract mentioned above can reflexly stimulate the vomiting center, this possibility of etiology cannot be disregarded in searching for the cause of the condition at hand.

In the long and fruitful search for the cause of nausea and vomiting of pregnancy, the placenta and fetal tissues have long been under scrutiny as a possible source. Among some of the less bizarre theories are included the following. Deutschman (23) promulgates the theory of infection of the placental tissue with ultramicroscopic organisms. He believes that the proliferating fetal cells and chorionic villi that are streaming in the bloodstream of the mother in the early period of pregnancy are infected with virulent micoorganisms which originate at the site of the implanted ovum or

at the site of placental attachment. This infective process produces the mechanical effects of emboli or thrombi in the vascular organs such as the spleen, liver, kidneys, etc., thus causing impairment of proper metabolism and giving the syndrome of nausea and vomiting, epigastric pain, increased blood pressure and abnormal urinary substances. He believes that nature combats this by establishing an immunity through immune bodies in the maternal blood.

Reed (68) agrees with Deutschman in that the pregnancy is the cause of the hyperemesis but doesn't explain just how he believes this happens. Adair (1) believes that one of the causes is that the placenta or growing fetus produces substances which cause an upset in the maternal metabolism and thus lead to pernicious vomiting.

Probably one of the newest ideas on the subject is that advanced by Schoeneck (72) who has run tests on a group of fifty six cases. Schoeneck found that an excessive amount of substance responsible for the reaction in the urine of vomiting cases has been consistant and quite constant as contrasted with the findings in normal pregnancies. He also found that when a previous case became pregnant again and was hospitalized on a strict dietary regime, no pernicious vomiting developed nor did the

patient's anterior pituitary like hormone become excessive in the urine as it had when she was a pernicious vomiter.

Of course in a test such as this which applied to the patient's urine, the true crux of the matter cannot be reached. If the APL substance is high in the urine, that still leaves one to wonder whether the patient is producing more of the hormone and is showing her symptoms because of too much hormone, or whether the patient has merely ceased to absorb the hormone for some reason or another and thus excretes more in the urine and is suffering because of a lack of the hormone.

Schoeneck thinks that to date there is insufficient evidence to indicate a hormonal explanation of the cause of pernicious vomiting but believes that the evidence is important enough to warrant further investigation.

The theory that something during pregnancy liberated a poisonous toxin or toxins has been extolled since the nausea and vomiting of pregnancy have been noted - and that time exceeds our written records. Much has been done to isolate or even to prove the presence of such toxins, but to date little has been accomplished. Even such a popular man as DeLee believes that the largest group of hyperemesis gravidarum cases fall into the

category of toxic in origin.(21).

Mack believes that a toxin or poison produced by the fetus or placenta may be the cause of vomiting of pregnancy.(55). This author believes that normal women become immune to these toxins and thus are not bothered by the classical signs and symptoms as are those less fortunate who are susceptible to the toxins and suffer consequently. However, he admits that no such toxin has been isolated. The number of workers and clinicians who believe in the toxin theory while unable to prove their point is unlimited.

As is natural the etiology of vomiting of pregnancy has been sought in the glands which are so important in the sexual cycle of the female. Probably the oldest and best known theory of etiology involving the endocrine glands is that evolved by Hirst as far back as 1915. (42). Hirst based his theory on the fact that every woman during her period of sexual activity constantly is absorbing corpus luteum hormone. Before the corpus luteum of one menstrual cycle disappears, another takes its place in forming a source of the lutein hormone to be absorbed. With the onset of pregnancy the absorbtion of the hormone ceases as the corpus luteum increases in size and ceases to secrete.

This increase in size continues until the third month of pregnancy; and it is during this time that nausea and vomiting are most frequent. Around the third month the corpus luteum ceases to grow and begins to secrete once more and nausea and vomiting disappear. Hirst is supported in his theory by Bessesen (8) but is termed "speculative and illogical" by Novak (63) who tested the theory clinically with poor results.

The thyroid is known to be intimately concerned in sexual function and has been brought into prominence in connection with hyperemesis by Falls (27). This worker noticed that many pregnant women showed evidences of mild hyperthyroidism. He also noticed that certain patients who died with the clinical picture of hyperemesis gravidarum might well have been suffering from toxic thyroids, since the clinical picture is much the same.

Falls believes that a certain minimum iodine intake is necessary during pregnancy and that when vomiting begins, for one reason or another, the decrease in iodine intake may initiate a vicious circle. He thinks that the thyroid stimulation found in normal pregnancy increases the amount of toxic substance secreted, which in turn increases the irritability of the sympathetic nervous

system, which causes more vomiting which decreases the iodine intake allowing the stimulation of the thyroid to increase and thus around the circle.

On the other hand, Davis (19) reports that he gets good results in certain cases of vomiting with the administration of small doses of thyroid where lack of secretion is evident. Which again emphasizes the fact that each case is an individual problem no matter what the condition.

A few years ago Kemp (46) began adding a few facts together and arrived at a new theory of etiology. Kemp noticed that in the laboratory dogs who had had their adrenals removed, gastro-intestinal disturbances were common. These disturbances resembled the nausea and vomiting of pregnancy. It was known at that time that the adrenal cortex of pregnant women undergoes hypertrophy, so Kemp theorized that the normal hypertrophy doesn't reach sufficient proportions to fully care for the mother's increased metabolic needs until around the third month of pregnancy when the vomiting ceases. This theory has been well received in only a few instances. (64).

The science of allergy is a rather new and unexplored field as yet, and with so much work being done in

this field and with the knowledge that a large percentage of people are susceptible to one type of allergen or another, it is not surprising that the cause of hyperemesis has been laid in this field by several workers.

Saxon and Stoll (71) fall in line with the multitude of authors who believe the cause of hyperemesis gravidarum to be due to a toxin or toxins unknown which are present in the maternal bloodstream. But these men apply a new wrinkle to the old idea in that they believe that the patient is sensitized to these toxins and that the nausea and vomiting are allergic manifestations. They have reported a number of cases which they treated successfully by immunization through auto transfusion against these toxins they believe to be present in the blood stream.

Finch (28) like Hirst has connected the time of nausea and vomiting with the growth and regression of the corpus luteum of pregnancy, but he believes the nausea and vomiting to be due not to a lack of absorbtion of the corpus luteum hormone, but due to a sensitization of the patient to the increased hormone output. This allergic reaction dissappears, he states, at the same time that the gland begins to regress, i.e., around the third month of pregnancy. Thus again we have an instance in which different workers attribute the nausea

and vomiting to the same cause but apply this cause in almost diametrically opposite manners. And yet in applying their theory of etiology to their method of therapy each claims a successful therapeutic test of his theory concerning the cause.

Harrawer (37) adheres to the theory of allergy by contending that the patient should be immunized against the placental proteins to which certain persons are especially allergic. Levy-Solal and Cohen-Solal (49) attempted to treat their patients on the basis of placental protein sensitization but failed to achieve results. They finally decided that the vomiting of pregnancy is based on the phenomenon of shock due to non-specific proteins. All of which opens a wide avenue to further investigation should this theory be true.

Calkins (12) suggests a possibility in etiology of hyperemesis gravidarum that has not been brought much to the fore. He suggests that the intestinal stasis or partial intestinal obstruction which may accompany pregnancy may cause a protein intoxication through the intestinal tract. The fact that toxemia can be caused by such a condition is a well recognized fact. The one weak point in his theory is the fact that at the time that nausea and vomiting usually first appear

the size of the uterus in relation to the abdominal cavity is not great enough to warrent the assumption of any intestinal stasis or partial obstruction. That the intoxication appears without intestinal disturbance appearing before it is also against this theory.

Another theory along somewhat similar lines but differing in the cause of the intestinal stasis is that brought out by Gardiner (33). This author proposes that on impregnation the trophoblast produces an inactive or protective substance which penetrates through the tube to the closely lying intestine, causing cessation of movement of the involuntary muscles even to the point of partial or complete intestinal obstruction. As a result of this obstruction, reverse peristalsis ensues, thus producing nausea and vomiting.

Gardiner believes that the reason all mammals aren't troubled with pernicious vomiting of pregnancy is that man is the only mammal that stands upright, and thus is the only one in whom the intestinal tract lies in close proximity to the genital tract; thus allowing the protective substance to penetrate to the intestine. How Gardiner intends to prove his theory isn't mentioned, and what basis he has for the idea isn't brought forward either. However, his method of treatment is based on

this therapy and he claims success with it.

Haden and Guffey (35) have demonstrated that sodium chloride in some unknown way acts as a protective measure in cases of high intestinal obstruction. Haden has also demonstrated the intimate association between toxic bodies and the level of the blood chlorides. Thus through the close chemical relationship between the inorganic constituents of the blood and intestinal obstruction, and through the close chemical relationship between the inorganic constituents of the blood and pernicious vomiting of pregnancy, the possibility of some relationship between intestional obstruction and pernicious vomiting is suggested, be the cause what it may.

It seems strange that men will read about the many and varied theories concerning the etiology of a condition, some of which theories are backed with scientific proof and evidence, and yet will promulgate some wild theory of their own, the proof of which exists only in their minds and the evidence of which it would be impossible to collect.

Such a theory seems to have been advanced by LaVake (48) who believes that the accumulated evidence tends to indicate that all forms of nausea and vomiting of pregnancy are manifestations of a toxemia due to the pregnancy

per se and that the other possible causes mentioned are secondary. He believes that the "most plausible" theory as to the origin of the toxic condition is that the toxin is derived from the protein constituting the male element in the fertilized ovum, and that this toxin acts directly in stimulating the vomiting center and the vital organs. Little else need be said about such a theory.

Almost every worker who has thought at all concerning the etiology of pernicious vomiting has seriously considered the role of psychic neuroses in the cause of this condition. All argument withstanding it cannot be denied that there are some cases in which neurosis plays an important part.

As Holman says (43), there are many factors in the beginning of pregnancy which might induce a woman to indulge in a bit of purely neurotic vomiting. There are those women who have long desired a pregnancy and who believe that vomiting is a part of pregnancy so they help it along all they can. Then there are women who are resentful of the pregnancy and who desire to show their husbands how much they suffer, so they vomit whenever they can when the husband is around.

Allen (2) while holding to the theories of focal

infections and glandular disorders believes that a neurotic condition is usually found at the onset of a case of pernicious vomiting. The number of workers is numerous who have classified a part of their cases under the heading of a neurotic basis. Among these are De Lee (21), Lobenstine (51), Andrews (4), Cragin (15), Tweedy (87), Reed (68), etc., to mention only a few.

On the other hand Stevens (77), believes that only the milder, physiological types of vomiting in pregnancy fall under the heading of neurotic, and that when the more severe type occurs there is some other underlying cause. Wright (94) agrees with Stevens on this point.

Then swinging to the other extreme we find those men who believe that all pernicious vomiting is on a neurotic basis and who treat their patients almost wholely with psychic therapy and who apparently get good results. Williams (92) believes that about fifty percent of his cases are due to neuroses and treats them accordingly. Atlee (6), (7) treats all his cases, even those who appear to be in extremis, with some form of psychic therapy.

He bases his theory that all pernicious vomiting

is on a neurotic basis on the following facts. First, he claims to have seen similar vomiting occur in the husbands of pregnant women. Secondly, he states that many cases of pernicious vomiting present clear evidence of psychic conflict somewhere in their story. Thirdly, he believes that since success attends so many widely varying types of treatment based on such widely differing pathological concepts, only a psychic basis could account for these successes. This last statement is hard to refute. Fourthly, he claims uniform success attending the treatment of the condition by suggestion alone.

Atlee gives us an example of to what extremes an idea, wise when applied correctly, can be exaggerated. Atlee, however, is confirmed by a few men who claim as uniform success thru treatment by suggestion as he does. (65).

For a good many years the genitals have been examined as a possible cause of the vomiting of pregnancy. Many workers and clinicians have theorized that the nausea and vomiting were caused by reflex stimulation of the vomiting center by the changed condition occurring in the genitals during pregnancy. DeLee (21) places a large group of his patients in the category of vomiting

due to irritation of the genitals such as retroflexed uterus, cervicitis, etc.

Rucker (70) has successfully combated the vomiting of pregnancy by clearing up a congested condition of the cervix noted in his patients with hyperemesis. He also corrects malpositions of the uterus in successfully treating this condition.

Stevens (76) also believes that irritation of the genitalia causes reflex nausea and vomiting but believes that the successful application of this theory to therapy involves a psychic factor as well. Lobenstine (51) states the belief of a number of authors when he says that he believes a large number of patients fall into the category of reflex vomiting due to early stretching of the uterus.

It is well to note that most authors believe that only the milder cases of pernicious vomiting are due to irritation of the genitals and that other factors enter in when the cases become more severe.

There is still another group of workers who adhere to a somewhat different school of thought concerning the etiology of this condition. Adair (1) and DeLee (21) place a part of their cases in the category of pernicious vomiting due to increased nervous irritability to be on

a hormonal basis as already mentioned.

Jones (44), however, swings far to one side and states that in some instances the vomiting is due to an "irritable condition of the pneumogastric nerve" and directs his form of treatment expressly at that point.

There can be little doubt that in most cases there is an increased irritability of the autonomic nervous system but that this structure is the basis of the vomiting is doubtful even in a few selected cases.

## TREATMENT

In the consideration of the treatment of hyperemesis gravidarum, the theory of etiology of the author in question must be kept in the background for it is upon this theory of etiology that the treatment is grounded; either in breaking up a cycle, furnishing substances which the maternal organisma lacks, or in combating substances which are already present. Treatment as considered here will deal mostly with deviations from the usual types of treatment such as bed rest, isolation, and interruption of the pregnancy except where these factors are unduly stressed; since these and like factors of treatment are quite generally used by all workers.

Murray (61), who believes that nervousness starts off the vomiting, attempts to prevent the patient from becoming toxic by affording complete rest to the stomach. He keeps the bowels well open by the use of calomel and saline aperients and applies a mustard leaf to the pit of the stomach. Only water, fruit juices and sugar water are given to the patient until well after all vomiting has ceased. Then the diet is gradually brought back to normal. Murray believes that a pulse of over 120 is sinister even without other symptoms.

Tweedy and Solomons (87), when the patient is toxic, give cathartics and wash out the stomach and colon by irrigation. Whenever there is any evidence of renal or bladder trouble correction of the trouble is attempted. Glucose alone or with sodium bicarbonate is given orally if there is any sign of acidosis. Bugbee (10) also improves the drainage from the colon believing that this minimizes the work the kidneys have to do in removing the bacteria due to intestinal putrefaction. Calhoun (11) gives his patients a mild cleansing soapsuds enema which is thoroughly evacuated. After this a retention enema of 8 ounces of 5% glucose solution is given which is retained through the day. During the day the patient takes small amounts of fluid every two hours by mouth. The author believes that 10% lactose is advantageous. The retention enema is repeated at bedtime and sodium luminal is given to aid sleep.

As far as the role played by foci of infection is known, most authors believe it to be a dogmatic principle to clear them up in treating any condition whatever it may be. Thus it is with pernicious vomiting. While most authors believe that foci of infection should be cleared up as a general rule in treating this condition, there are a few authors that stress this factor especially.

Talbot (79) believes that the chronic sepsis in or around the dental structure which is the cause of pernicious vomiting should be treated if this condition is to be successfully combatted.

Cornell (14) stresses the necessity for eliminating foci of infection in the therapy of this condition. He stresses the importance of abdominal disturbances such as gall-bladder disease, chronic appendicitis, ulcers of stomach and duodenum, infections of the head, cervicitis, vaginitis and appendicitis. These must be eliminated if the vomiting is to cease.

The use of carbohydrates in the treatment has grown to be one of the best favored and most important measures used in the successful therapy of pernicious vomiting.

Titus (84) claims priority of the intravenous glucose therapy which he advanced in 1925. His treatment is about the same in all his cases, but becomes more energetic the more severe the condition the woman is in. In his mild cases he prescribes numerous high carbohydrate meals daily with lots of rest. He also gives these patients two ounces of a ten percent lactose and two percent sodium bicarbonate solution every two hours. This treatment continues until well after the patient has ceased vomiting when the diet is gradually restored

to normal. In Titus' moderately severe cases he prescribes isolation, fasting for twenty-four hours except for glucose solutions by mouth, and daily enemas. He gives proctoclytic sedation in the form of bromides and chloral hydrate and gives intravenous glucose if needed. This continues until the vomiting has ceased, when the diet is gradually increased to the normal level. In his severe cases the treatment is essentially that given above, but is pushed more vigorously. The intravenous glucose is given in twenty-five to fifty percent solutions in doses of fifty to seventy-five grams one to three times daily.

Titus favors the twenty-five to fifty percent solutions of glucose because he believes they tend to exchange more quickly in the bloodstream,i.e., the toxins are diluted, edema lessened, and the sugar seized by the tissues more rapidly; and because he believes that the weaker solutions favor reactions.

In a later article (86) Titus advises the use of insulin with the glucose where the high blood sugar level indicates a low reserve pancreas and an inability to utilize the glucose.

The number of authors confirming and endorsing the work of Titus is enormous and a summary of their

work would be repetitious and out of place here. There are a few whose work bears inspection at this time, not because they have added anything startling or radical to the carbohydrate therapy regime but because perusal of their methods will serve to illustrate the similarity of the various methods following this method of therapy.

Holman (43) treats his mild cases of hyperemesis gravidarum with fractional high carbohydrate feedings, especially forty-five minutes before rising and before retiring. Every four hours while the patient is awake he gives her fifteen grains of triple bromides to aid in calming the patient both physically and mentally. In his severe cases he believes that hospitalization is imperative. He places his severe cases in isolation, under sedation, and gives nothing by mouth until the vomiting has ceased. Meanwhile he gives three to five hundred cc. of twenty-five percent glucose twice a day intravenously and a quantity of normal saline by the same route judged to be sufficient to combat the dehydration. He gives alkalies in the form of three to four percent sodium bicarbonate per rectum. When the patient has ceased vomiting, food and fruit juices in frequent small amounts are begun by mouth, and the patient is turned on her right side so that the food stays in

the stomach only the shortest possible time and doesn't tend to accumulate. Holman believes that psychology is important as some patients continue vomiting because they don't want to go home to their humdrum existance and housework.

Brewer (9) in treating his mild cases directs the patient to give up her household duties, rest in bed, move her bowels daily, abstain from proteins, eat plenty of carbohydrate food, and take a sedative. For his severe cases he puts them to bed and gives them nothing by mouth for twelve to eighteen hours while three to four hundred cc. of five per cent glucose are administered every four to six hours by the Murphy drip method. Sedation is given in the form of sodium luminal. In breaking the fast Brewer gives his patients a mixture of Karo syrup and Dryco or Klim milk for a period until other foods can be kept down.

D'Arcy (17) encourages her patients to drink sweetened orange juice, barley water with fruit juice, and water. If the vomiting persists she gives the patient a five percent glucose solution by rectum in doses of three hundred cc. every four hours or by the Murphy drip method continuously per rectum. If the patient tends to salivate excessively, D'Arcy administers atropine grains

1/120 every eight hours. At times she gives an alkaline mixture containing bismuth to aid in combatting the acidosis.

Fitzgerald (30) has made a study of the results of glucose therapy at the Cook County Hospital. The patients in his series were varied: one-third of them were negroes, one-tenth were unmarried, and two-thirds were multiparas - about the same figures as were found among the normal pregnancies in that hospital. Fitzgerald found that fifty percent were discharged after only one week of treatment while sixty-eight percent were discharged by the tenth day in the hospital; so that less than thirty-three percent had to be treated longer than ten days. The treatment consisted of nothing by mouth for the first twenty-four hours; meanwhile a five percent glucose in saline enema was given. Intravenous glucose in saline was given in varying quantities deemed sufficient to combat the dehydration, and as soon as vomiting had ceased, food in frequent small quantities was begun by mouth. The patients were discharged when they had been free of all vomiting and had been on a normal diet for several days.

Fitzgerald made several interesting conclusions

from this study. He decided that color, age, parity and marital status have no influence on the course of the disease. He also believes that the ability to retain food and fluids in the seriously ill patient is not an indication of improvement. He states that persistent tachycardia, fever, diacetic acid and acetone are the danger signals that must be watched lest the proper time for interruption of the pregnancy be missed and the case lost.

Thalhimer (81) improved on the carbohydrate method of therapy somewhat - at least he believed it to be an improvement and many men have sided with him in his belief. Thalhimer believed that the varying blood sugar levels found in pernicious vomiting indicated a low pancreatic reserve and that the pancreas wasn't putting out enough insulin to take care of the carbohydrate that was coming into the body. So in his treatment of hyperemesis gravidarum he gives insulin along with his increased carbohydrates by mouth and vein.

To be specific: he gives the patient glucose in ten percent solutions so that she will be getting a supply of water to combat the dehydration as well as the needed carbohydrate. The ten percent solution is kept warm and run in slowly at the rate of from two to

three hundred cc. per hour. Usually only one thousand cc. is given at one time. Fifteen minutes after the intravenous medication is begun, ten U-iletin units of insulin are given hypodermically. At intervals then, ten units of the insulin are given so that thirty units of insulin are given for each one thousand cc. or hundred grams of the sugar administered. If other types of insulin are given it is important to keep in mind that a slight excess of the glucose should be given to prevent a hypoglycemic shock.

Thalhimer advises that epenephrin should be available for use in treatment of hypoglycemic shock but says that he has never had to use it.

Besides the use of the insulin and carbohydrate, Thalhimer believes that colonic irrigations, sedation and gastric lavage all have a place in the treatment of this condition.

Thalhimer is substantiated by a number of men of whom there is a place for only a few here. Waters (90) treated a series of eighteen cases of hyperemesis gravidarum. Of these eighteen cases thirteen received a high carbohydrate diet, adequate fluid intake, saline, hypodermoclysis, symptomatic treatment and corpus luteum before they were finally cured by the use of carbohydrate

and insulin. Of these thirteen cases cured, one suffered a relapse which was quickly overcome by a renewal of the treatment.

Allen (2) and Lewis (50) also treat their patients with carbohydrate and insulin and report success. Lewis, however, finds that the insulin and glucose offer benefit in only certain types of patients, but believes that it is of great value in those cases which result from a derangement of the carbohydrate metabolism, either because of the pregnancy itself or because of the continuous vomiting due to some other cause.

On the other hand, however, Titus is firmly convinced that the use of insulin with intravenous glucose is contraindicated in toxic vomiting of pregnancy and all other acidoses because storage of the sugar in the liver as glycogen and not combustion in the muscles is the desired effect.

Titus (84) says, "Injection of glucose alone is like sypplying fuel to a furnace that has burned low, at the same time storing some in the fuel bin, whereas to add insulin to the glucose is like pouring kerosene on the coal to make it burn faster". In reply to this accusation, Thalhimer (84) said that the amount of insulin given would not harm the glycogen storage in the liver. He

further added that his cases ceased vomiting in six to eight hours after treatment was instituted whereas the cases cited by Titus didn't stop vomiting before treatment had been underway at least twenty-four hours.

Harding (36) while not as against the use of insulin as is Titus appears to be, does not consider insulin as a valuable adjuvant to treatment in the majority of cases.

The use of sedation in the treatment of hyperemesis gravidarum is somewhat parallel to the use of psychic therapy: admitted by all and overdone by a few. Nearly all clinicians believe that a certain amount of sedation is necessary in the treatment of this condition but a few workers have let the matter get out of hand and give sedation their devoted attention with consequent loss of the other pertinent factors in the therapy of this condition.

Calkins (12) however, isn't one of those who rates sedation above all else. His treatment, however, does include it as an important part so it is given here. Calkins has worked out a routine which works very well with his patients. He first puts the patient to bed and cleanses the bowels by repeated enemata. Several hours later sixty grains of sodium bromide in two or three

ounces of water are given per rectum. This dose is repeated every six hours throughout the twenty-four for a few days and is then gradually cut down until a level of about twenty grains is reached. After the first day of fasting, small quantities of a high carbohydrate diet are allowed and the quantities are slowly increased until the patient is on a normal high carbohydrate diet.

Andrews (4) follows much the same routine, but after the initial sedation with sodium bromide per rectum he gives the drug in twenty grain doses by mouth. If the acidosis is marked, Andrews advises the use of glucose and normal saline intravenously. If the acidosis can't be controlled by this method then he advises the use of insulin. Andrews mentions one disadvantage of bromide sedation - that being the familiar bromide psychosis. This he combates by decreasing the drug and giving sodium chloride subcutaneously, intravenously, or by mouth.

Dieckman (25) believes sedation to be an important adjuvant to the treatment of pernicious vomiting, but he uses phenobarbital, believing it to have a depressant effect on the vomiting centers, thus aiding in the treatment in a twofold manner. However, where additional sedation is desired the author uses sodium bromide.

Miller (58) states that he has had exceptional success with sodium luminal in treating this condition. He believes that the efficacy of this drug in this condition lies in the fact that it tends to check the pylorospasm which he believes to be largely responsible for the vomiting of pregnancy.

Jones (44) uses bromide sedation in his cases but also has achieved success with chloral hydrate which he recommends in this condition. Kosmak (47) who treats his patients almost entirely from a dietary standpoint believes that the emplyment of drugs should be generally condemned.

Oliver (66) is of the mind that the varied diet given most pregnant women is nevertheless deficient in calcium and phosphorus. This fact in addition to the increased demands made by the fetus on the maternal organism for phosphorus and calcium makes it imperative that these factors be added to the mother's diet.

Drennan (26) believes that treatment of pernicious vomiting should consist of a liberal calcium diet with a lessened protein intake for the reasons discussed under Etiology.

Sussman (78) treats his patients with parathyroid extract as well as with calscium gluconate on the basis

that when there is damage to the liver as there is in pernicious vomiting the action of the parathyroid gland is upset and this lack must be supplied if there is to be normal calcium metabolism. Clinical experience has proven that calcium when given alone takes much longer time to evoke a response than when given in conjunction with parathyroid extract.

Holman (43) increased the amount of ultra-violet rays that his patients were exposed to on the grounds that this aided calcium metabolism. His results were good, but the routine measures that were employed along with the ray therapy confuse the issue so that true evaluation of this form of treatment is impossible.

There are several authors who report success with the use of hydrochloric acid per mouth in the treatment of pernicious vomiting. Mason (57) gives his patients dilute HCL per os up to as much as thirty drops three times a day. Mason mentions that Roberts of England has found that the use of caffeine citrate to stimulate the flow of HCL in the stomach is more pleasant to the patients than is the use of dilute HCl. Crossen (16) also includes ten drops of HCl in a half of glass of water before meals in his treatment of this condition.

Quite the opposite of this form of therapy is that

which includes the use of alkalies to combat the acidosis of this condition. Cragin (15) favors the use of sodium bicarbonate with large amounts ofwater believing that the addition of the alkali gives the body a greater opportunity to neutralize the acids formed and thus spares the fixed alkali or alkaline reserve of the body. Fischer (29) uses alkali, salt and water to combat the acidosis of hyperemesis which he believes is due to a nephritic condition.

Hasselbach (39) noted that the alkaline reserve of the mother was decreased during pregnancy and even more so when nausea and vomiting were present, so he favors the administration of alkalies even in the abscence of nausea and vomiting. Stander (75) favors the somewhat radical method of intravenous administration of sodium bicarbonate in treating the acidosis of this condition even after glucose-insulin therapy has been instituted. Marriott and Howland (57) give from ten to one hundred grams of sodium bicarbonate in order to compensate for the "uncompensated acidosis" of early pregnancy which they believe may be at the bottom of pernicious vomiting. Wilson (93) reports that by increasing the carbon dioxide combining power of the blood by the use of intravenous sodium bicarbonate he has obtained excellent

results in treating hyperemetic patients.

High colonic alkaline irrigations are given by Grogan (34) as well as alkaline preparations by mouth. Denyer (22) reports good results with gastric lavage using sodium bicarbonate one dram to the pint and from one to two pints with each lavage.

Among the rather recent reports in the literature are those which deal with the various psychoses, neuritides, and general debilities due to avitaminosis because of long spells of vomiting or limited diet because of other reasons. The danger of this happening in most cases of pernicious vomiting is rather rare due to the somewhat abbreviated length of the average case. Now and then, however, a case of long standing or one in whom the general condition was none too good to begin with will show signs of avitaminosis. Luikart (53) reports a case which after being cured of a long seige of nausea and vomiting of pregnancy relapsed with synptoms of avitaminosis and died in spite of a forced high vitamin diet.

From this it can be concluded that it might be well to begin vitamin therapy early in the treatment of hyperemesis, especially if the patient's diet has been low in vitamins before or during her pregnancy.

The use of fluids in the treatment of hyperemesis is

a common practice among the majority of workers. But these men use the fluids to combat the dehydration that is the result of the continuous vomiting and not to combat any specific cause of the condition. However, Davidson (18) advocates the use of intravenous fluids for the purpose of diluting toxins and reducing the molecular concentration of the blood. Through a stomach tube this author instills from two to three pints of warm water every four hours. This would appear to be a case of an accepted factor in therapy practiced through misconception of its action.

Hendon (41) also practices what he terms "venoclysis" by the instillation of continuous physiologic and therapeutic solutions directly into the blood stream. This he does,not because he believes that there is any direct action on the condition, but because he believes it furnishes a mode of introducing nourishment into the body while leaving the alimentary tract absolutely free from work to recover its normal tone.

In the consideration of the use of glandular extracts and hormones in the treatment of pernicious vomiting, there are two sides of the question to be considered in speaking of each endocrine gland: the school that believes that too much hormone is excreted,

and thus attempts to decrease or nullify the effect of that hormone; and the school that believes that the gland is not working as much as it should, and thus attempts to increase or administer more of the needed substance.

In considering the thyroid gland Falls (27) believes that certain cases of pernicious vomiting are due to a hyperthyroidism and should be treated by decreasing the amount of thryoxylin produced by the gland. This the author does by giving his patients the routine therapy with Lugol's solution so familiar in the treatment of hyperthyroidism. Falls also substitutes saturated solution of potassium iodide in ten drop doses for the Lugol solution where he thinks it is better tolerated or where the Lugol's solution doesn't seem to be giving the desired effect. Falls also uses glucose in the various forms in his treatment of these cases thinking that "it protects the body proteins and fats otherwise broken down by the increased metabolism secondary to the hyperthyroidism".

Another method of combatting this increase in thyroxylin of course would be to remove a portion of the gland surgically. Apart from the time-honored reasons for treating the patients medically rather

than surgically wherever possible, Watson (91) thinks from a study of patients showing the presence of goiter during pregnancy that an operation on the gland is attended by more danger than would be the case in the non-pregnant woman and does not advise operation.

In considering the other side of the question, Davis (19) reports excellent results from the administration of small doses of thyroid where evidence of lack of thyroid is evident in cases of pernicious vomiting. He gives his patients three grains of thyroid daily for several months and claims pronounced improvement in the patient apart from the cessation of the vomiting.

Lobenstine (51) is another who gives his patients thyroid. He gives his in the form of thyroprotein and alternates it with lutein hormone of one form or another. The hormones are given daily and alternated for a period of at least two weeks. If the patient is toxic Lobenstine advises that she be fed only per rectum. In severe cases the author also gives intravenous glucose and insulin.

Hirst (42), who believes that the lack of corpus luteum hormone produced by the early growth period of the corpus luteum of pregnancy is the cause of pernicious vomiting, was the first to apply hormone therapy to this condition. As early as 1915 this author was

using this form of therapy. His early preparations were aquaeous extracts of the gland which worked very well in his opinion.

Bessesen (8), who agrees with Hirst's theory, gets a high percentage of good results with injections of corpus luteum hormone. However, he believes that when the condition has persisted for some time the patient's condition is aggravated by starvation and dehydration and these must be treated with something else besides glandular therapy. Cornell (14) uses hypodermic injections of corpus luteum as part of his routine therapy for pernicious vomiting.

Wright (94), who believes that the essential point in the treatment of hyperemesis gravidarum is the treatment of the acidosis, uses corpus luteum as a routine. He gives one cc doses daily but admits that when the treatment was not given, there was little difference in the way the patient responded.

A bit more on the anit-luteum side is Novak (63) who used Hirst's method of therapy with very poor results. Novak believes that the aqueous solutions of corpus luteum are inert and considers this method of treatment to be the least desirable kind of organotherapy. Holman (43) after studying the physiology

associated with pernicious vomiting says that he cannot see any reason for the use of hormonal extracts in the treatment of this condition.

On the opposite side of the fence is Finch (28) who after noting the change in size of the corpus luteum during the early months of pregnancy just as did the above authors - decided that the nausea and vomiting were allergic responses of the maternal organism to the corpus luteum hormone to which it was sensitive. Thus his method of treatment consists of desensitizing the patient to this hormone.

He treats his patients to a course of gradually increasing doses of progestin after which they are relieved. He found that cutaneous injections of 0.02 to 0.03 cc. of progestin gave cutaneous reactions directly proportional to the severity of the patient's symptoms. He also ran a control series of five pregnant women without nausea and vomiting and found negative cutaneous reactions in all five cases. He found that a high per cent of those patients within all five cases. He found that a high percent of those patients with nausea and vomiting had a fmaily history of allergy.

Finch concluded therefore that intradermal testing before pregnancy may determine whether or not the patient

will be afflicted with nausea and vomiting during the early months of her pregnancy.

Harrawer (37) believes that the administration of placental substance tends to establish an artificial immunity to placental proteins to which some women are unusually sensitive. He runs his patients through a course of treatments similar to those of Finch except that his agent is placental extract. Harrower reports favorable results from this form of treatment.

This work was confirmed by Levy - Solal and Cohen-Solal (49) who also obtained satisfactory results with desensitization using placental extracts. These workers also used Witte's peptone on a series of eight patients in a similar course of desensitization. They ruled out the possibility of mental suggestion and used no other form of therapeusis. The results were uniformly successful. From this they concluded that the vomiting of pregnancy has its origin in a sensitization to some non-specific protein and that desensitization can be carried out successfully.

Carter (13), after examining the proposed theories of etiology of hyperemesis, decided that they are still open to attack and that until one of the proposed theories is proven or until a more satisfactory one is proposed

the condition must be treated empirically. All of which seems to be a poor reason for choosing ovarian extract as a form of therapy. In mild cases, however, Carter has had good results with the administration of five grains of ovarian extract per os every three hours. At the same time only liquids are allowed until the vomiting ceases. In his more severe cases Carter gives the extract by hypodermic injection since the constant vomiting precludes its successful administration by mouth.

Hawkinson (40) treated fifty cases with estrogenic preparations and had good results in ninety-six percent of the series. He administered the preparations in dosages of 250 to 500 R.U. daily until the vomiting ceased. The preparations used were Emmenin, Amniotin, Theelin, Progynon and Progynon B. Several of the patients required only one injection and nearly all were cured of their vomiting before a week had passed. Five patients were cured of their vomiting through oral use of the preparation only.

The rationale for using estrogenic preparations in the nausea and vomiting of pregnancy has not been definitely established, but the association of nausea and vomiting with a deficiency of estrin has been noted.(78)

Offergeld (64) uses hormone therapy on the basis that pernicious vomiting is mainly due to an increased irritability of the nervous system on the basis of incretory disturbances. Thus he advises the use of preparations of the ovaries and of corpus luteum.

The rational for using supra renal cortex extract to combat nausea and vomiting was proposed in 1932 (46). At this time Kemp reported six cases who were treated with this form of therapy during the first trimester of pregnancy with good results. Three years later Freeman and Melick (31) reported one case who was started on glucose-saline and insulin therapy and then immediately changed to suprarenal cortex injections. The patient did not receive any glucose-saline and insulin for four days before her urine became acetone free, but made steady progress toward recovery on the cortex injections.

Two years later the same workers had worked up a series of seventy-eight patients treated by this form of therapy (32). Tablets and ampoules equivalent to three grams of dried adrenal cortex were used. In the mild ambulatory cases the tablets were self administered in doses of one tablet t.i.d., one-half hour before meals. If at the end of the week symptoms hadn't completely ceased they were put on six tablets a day until the

bottle of one hundred tablets was taken.

In the case of patients who vomited at irregular intervals or who vomited everything taken by mouth, ampoules of the adrenal cortex equivalent to three grams of dried gland were injected in doses of one ampoule t.i.d., one-half hour before meals. These injections were continued for three days after all nausea and vomiting had ceased, then one ampoule was replaced by one tablet on each successive day so that by the end of the sixth day the patient got three tablets per day. This was continued until one hundred tablets were taken.

The results obtained were very gratifying. Of forty-seven cases of mild vomiting, only two failed to benefit; while in thirty-one cases of severe and pernicious vomiting all were cured in from three to four days. It would seem here that this was indeed therapeutic proof of the involvement of the suprarenals in the etiology of pernicious vomiting.

Another rather rare form of treatment is that offered by Jones (44). This worker believes the cause of pernicious vomiting to be an irritation of the pneumogastric nerve causing reflex vomiting. He attempts to combat this by the sedative action of electrotherapy. The current is applied over the abdomen for ten minute periods twice a day.

The author reports several cases where this form of therapy has proven to be a valuable aid.

The use of the inverted ventral position is common in the treatment of retroverted uterus (70), however, Gardiner (33) places his patients in this position in order to allow the gastro-intestinal tract tofall away from the genitals so that the substance produced by the young embryo will not cause a partial or complete intestinal obstruction.with the resultant nausea and vomiting. Gardiner also gives his patients sedation to decrease the bowels sensitivity to this peculiar substance produced by the trophoblast.

He believes that starvation and dehydration are beneficial to the patient in that they constitute a method of defense. He substantiates this by pointing out that the mummy is preserved by dehydration, that prunes retain their nutriment through dehydration, and that infection spreads slowly through dehydrated tissues. However, the author does give a minimum of dextrose per rectum although he does not justify his doing so by any explanation.

The role of psychic or neurotic vomiting in the etiology of vomiting of pregnancy is admitted to be important by even the strongest advocates of a toxic

factor in pernicious vomiting. However, as with all theories there are a few men who carry the matter too far. They cling so closely to their idea that as the proverbial saying goes, they are "so close to the trees they can't see the forest".

Atlee appears to be one of these men. He believes the sole cause of hyperemesis gravidarum to be neurotic (6), (7). Thus his treatment is conducted accordingly. While it doesn't seem to be very humane, in line with medical traditions, or even comforting to the patient, Atlee claims excellent results with it.

The patient is placed in bed and denied the "solace of the vomit bowl" - she is instructed to vomit into the bed if she must vomit. The nurse is instructed to take her time in getting around to changing the sheets. The patient is assurred dogmatically that she is going to stop vomiting at once and that she is going to leave the hospital in a week perfectly well. Atlee tells the patient to eat whatever is put before them and the nurse is instructed - in the patient's hearing - to give the patient another meal twenty minutes after they have vomited the last one. The patient is put on a full hospital diet.

Atlee's only concession is to give glucose and saline

occasionally if the patient is dehydrated - but he does this not because he believes it is an aid in stopping the vomiting, but because the patient's condition warrants the fluid whatever the cause of the dehydration.

The author cites twenty-five cases in which he has obtained good results - even in the face of a pulse of 125, four plus albumen and all the other criterid of a seriously ill case of pernicious vomiting. He states that he merely has to enforce his suggestion drastically enough and the vomiting ceases. Apart from other logical criticisms, the wonder is that his patients stick out the week imposed on them.

DeLee's earlier method of treatment (21) consisted mostly of isolation, suggestion, light diet and rectal feedings, but more recently he has been advising the intravenous use of glucose and sedation.

Rice (69) while treating his patients medically practices mental suggestion in that he advises that no unnecessary sympathy be given the patient so that she may get her mind off her condition as much as possible. He advises that the emesis basin be kept hidden.

Oldfield (65) treats his cases in much the same way as does Atlee but also gives rectal infusions of four per cent glucose and purgatives when deemed advisable.

For years the last resort in treatment of cases of pernicious vomiting has been interruption of the pregnancy. The time to perform this operation is one that requires good clinical judgement. If done too early there is always the argument that the patient might have recovered if the medical therapy had been carried on a bit longer. If performed too late, there is a grave chance that the patient may go on and die in spite of the operation. The different workers are fairly well agreed on the signs that signify that medical treatment has been a failure and that therapeutic abortion is indicated.

No response to treatment is the first and foremost sign of an impending need for surgery (4). This is evidenced by an increasing dehydration and an increasing acidosis as evidenced by the increased respirations, pulse rate, etc, Jaundice is taken by some workers as indication for surgical intervention (6). Increasing fever, albumen in the urine and oliguria are other criteria if they are not improving any.

In recent years eye signs have become prominent in the criteria of whether an abortion is necessary. Dawson (20) reviewed four cases which were suffering from pernicious vomiting and which showed signs of horizontal nystagmus -

this sign disappeared several days after the uterus was emptied.

Severe cases of hyeremesis gravidarum showing hemorrhagic retinitis have been reported by Stander (76), Tillman (83), and Waterman (89). All these authors concluded that finding of a hemorrhagic retinitis is a serious prognostic sign and that interruption of the pregnancy should be undertaken immediately. Almost all the cases in which this sign occurred were fatal.

As to the method of interruption - dilatation and currettage if the age of the embryo permits - otherwise remove the fetus by the route of the least possible trauma and shock to the mother (80). This may be done by means of bagging, packing, or vaginal hysterotomy. The anaesthesia is left to the operator's choice but one should be chosen with the pre-existing liver damage in mind.

There are those who do not believe that interruption of the pregnancy has a part in the treatment of hyperemesis gravidarum. This cannot be challenged. This at least we know - if a patient is not aided by medical treatment, barring complications, a therapeutic abortion if performed properly and at the correct time will save that patient.

I have not tried to draw any conclusions other than those expressed throughout the paper where I have evidenced regard or disregard of a theory or a mode of therapy. I believe that perusal of the literature is only a step toward drawing a conclusion - the rest of the way toward the goal is personal clinical experience.

Hawkinson (40) has made an analysis of the literature which may be of aid in showing how the various forms of treatment are favored.

| | | | |
|---|---|---|---|
| Intravenous glucose | 38 | Br/rectum | 10 |
| Sedation - oral and hypo | 25 | Intravenous saline | 8 |
| High CHO diet | 17 | HCl orally | 6 |
| C. Luteum extract | 15 | Ovarian extract | 5 |
| Alkalies | 15 | Gluco-saline intravenously | 5 |
| Insulin | 14 | Adrenal cortex extract | 3- |

These figures roughly approximate the way the men were divided in the reports covered by this author.

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