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Observations on the Use of the Oils and Reports of Cases.

BY

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A SUGGESTION AS TO THE ACTION OF OLIVE OR COTTON-SEED OIL IN GALL-STONE COLIC:

Observations on the Use of the Oils and Reports of Cases.[1]

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WITHIN the past three years the old plan of treating gall-stone colic with large doses of olive oil has come much in vogue, and many communications have appeared in the journals at home and abroad as to its efficiency, but no adequate explanation has yet been offered as to its *modus operandi*. The lack of a wherefore might seem a matter of slight moment, in view of its efficiency were it not that, because no plausible theory of the action of the oil has been suggested, the method has not only failed to receive recognition by therapeutists, but has been subjected to much adverse criticism, efforts having been made to bring it into disrepute, the supposed success of the oil being attributed to errors in diagnosis. This last is perhaps due to the fact that in none of the reported cases in which the oil treatment was used has it been stated that calculi were found which by analysis were shown to be true gall-stones, it either being carelessly taken for granted that the concretions passed were of this nature, or it was stated that masses of soap alone were met with.

Excluding the rare instances in which entozoa mislead, it is unquestionably true that to establish a diagnosis of hepatic colic due to the passage of

[1] Much of the oil sold as olive oil is really refined cotton-seed oil. The difference in chemical composition and properties is not very great. Olive oil contains a rather larger proportion of the more fluid fat, olein. In one of my cases olive oil was prescribed; in the other cotton-seed.

gall-stones or of inspissated bile, the finding of concretions in the feces is not essential: certain unmistakable subjective and objective symptoms determining the matter very readily. But where these are not detailed, and the ability of the reporter both to apprehend the facts and to make proper deductions therefrom is unknown, an element of doubt as to the verity of the diagnosis is present which renders the conclusions reached valueless. Perhaps for this reason the oil treatment of gall-stone colic has until lately received such scant recognition.

Although at first I was altogether sceptical of a method which seemed founded on no sound theoretical basis whatever, and very naturally viewed with suspicion reports emanating from observers who made the extraordinary blunder of mistaking easily recognizable lumps of soap for gall-stones, their physical appearances in the quantities passed when large doses of oil are taken, being such as scarcely to mislead even the most careless,[1] communications favorable to the treatment continuing to appear, some emanating from known reliable sources, induced me, somewhat less than a year ago, to look upon it with favor and to search for an explanation of the efficiency of the oil. On giving the matter a little consideration then, it occurred to me that if the treatment were efficient the effects attributed to the oil were more likely due to a product of its chemical decomposition, glycerin.

That oils and fats are decomposed in the duodenum into their fatty acids and glycerin there seems no doubt, and this decomposition is probably

[1] It might be well to recall here a fact not generally known, that gall-stones may rarely be perfectly soft and pultaceous, and as susceptible of being kneaded into various shapes as a piece of putty. This form of stone is believed by Harley to be composed of cholesterin in the preliminary stage of crystalline formation. They may easily mislead, resembling, as they often do, dirty-white barleycorns, orange-pips, grapes, etc. See Harley, *Diseases of the Liver*, Amer. edit., pp. 336, 337. A case of this sor. is related by Harley, where he mistook two oblong steatomatous concretions, moulded into the shape of lemon seed, for the latter *Idem*, p. 344.

effected by the pancreatic juice through the action of a fat-splitting ferment, steapsin, as was shown by Bernard. It is now well known that the ingestion of a large quantity of oil is succeeded by the presence in the feces of innumerable masses of soap, the base of which is principally sodium,[1] formed no doubt by the union of the fat acids with the alkali of the pancreatic juice and the bile.[2] It would appear not improbable that glycerin so liberated exerts in the duodenum an action similar to that which takes place when it is introduced into the rectum; withdrawing water, and causing hyperæmia and irritation of the afferent nerves of the part with which it comes in contact, thus leading to powerful reflex peristalsis.[3] In addition to the active contraction which would be caused by the presence of glycerin in the duodenum, and which of itself would probably lead to energetic reflex contraction of the gall-bladder, cystic and common bile-ducts, so that concretions lodged therein, sufficiently small to be expelled, would be rapidly passed onward into the bowel, it is not unlikely that the power of diffusion possessed by glycerin would enable it to enter the ductus communis and even the cystic and the hepatic ducts, and, perhaps, reach the gall-bladder and the liver, producing a similar depletion of the vessels there and, reflexly, exciting the muscular fibres of these ducts to contraction. In consequence of this action of glycerin a copious outflow of diluted bile would also probably occur, which would materially assist in expel-

[1] See report by Wiley in Prentiss's case, MEDICAL NEWS, May 12 and July 28, 1887, and many others scattered through the journals, in which these masses, by analyses, are shown to be saponified oil. In Prentiss's case complete saponification of nearly a pint of oil is stated to have occurred.

[2] The question whether the intestinal canal contains sufficient alkali to unite with a large quantity of fat acids has no bearing on the well-recognized fact that these acids and glycerin are liberated through a decomposition of the oil in the duodenum.

[3] As was suggested by Anacker (Deutsche med. Woch., Sept. 15, 1887), to whom we are indebted for its recent reintroduction into practice as a laxative, by enema.

ling the stone. These, I believe, would be the probable results of the introduction of glycerin into the duodenum in a case of gall-stone colic, in which the stone was not too large to pass readily through the duct: its extrusion following and pain ceasing. As I shall subsequently show, by relating two cases in which this treatment was resorted to, oil in large quantity apparently has the power to check hepatic colic by promoting expulsion of the calculus. That this result is brought about neither by a lubrication of the duct in which the stone is lodged nor by a partial solution of the calculus, has been shown by Chaffard, and as these are the only modes of action at all conceivable if oil itself, and not a product of its decomposition, is the efficient agent, it is likely that oil is not. Since no explanation can be offered as to the efficiency of the oil, and it is known that glycerin is formed from it in the duodenum, and since it is probable that glycerin can produce the effects attributed to the oil, it is likely that these are due to glycerin.[1]

Though this suggestion is sufficiently plausible to meet the facts, I should have hesitated to offer it now, unsupported by experimental evidence, were it not that, since it occurred to me, an enforced absence from my work for a number of months has prevented me from carrying out some experiments on dogs, projected last spring, to determine its value. I should not have placed it on record at this time, but that I desire to report without further delay two cases of cholelithiasis recently encountered, about the diagnosis of which there is no uncertainty, and in which oil was resorted to, to relieve the attending hepatic colic. I thought this a fit opportunity to offer my theory of the action of the oil,

[1] Rosenberg (Fortschritte der Medicin, No. 13, 1889) has recently ascertained an important fact which tends to support my suggestion. He has found, by experiments on dogs with gall-bladder fistulæ, that large doses of olive oil greatly increase the quantity and diminish the consistency of the bile excreted. It would appear inconceivable that olive or cotton-seed oil could have such an effect, save in the manner I have proposed.

that the use of what has been an efficient remedy in my hands might be placed on a rational—if yet theoretical—basis.

CASE I.—Mrs. K., aged forty-two, of short stature, weight 185 pounds, had had attacks similar to that for which she sought relief, for six years. These had occurred at intervals of about six months, for the first three and a half years. She was then free from them for two years, but in the previous six months she had had several. The attacks were usually of long duration, and associated with jaundice. The state of cholelithiasis had never been treated, the attacks alone receiving attention from her physician; morphine being freely used hypodermatically and by the mouth. She was not aware of the nature of her ailment and had never been told to search for gall-stones. I was first sent for on September 29th. As I was then absent from the city, Dr. Pottberg called in my place. Her symptoms were those of pronounced gall-stone colic. She had been in great pain for two days. Dr. Pottberg informs me that having once before administered a half pint of olive oil to a case of gall-stone colic, with the result that all pain entirely ceased shortly after without a resort to anodynes, he concluded to use it in this case. After some persuasion the patient was induced to swallow a half pint of oil, no other medication being used, save heat to the hypochondrium. Pain continued very severe for a half hour and then ceased abruptly. A saline purge was taken a few hours after. The feces were not searched for gall-stones, but an inspection of them by Dr. Pottberg the day following the administration of the oil, showed a great quantity of semi-solid lumps which he very naturally looked upon as concretions resulting from the use of the oil.

The patient remained entirely free from pain until the morning of October 3d. An attack then began, as before, with sharp paroxysmal pain in the right hypochondrium; rigors, followed by fever, gastric irritability and flatulence. I first saw her on the afternoon of October 4th. The liver was found to be enlarged and the lower margins painful on pressure, especially in the region of the gall-bladder. The skin was slightly icteroid, but, it was stated,

not more so than was usual in the interval of the attacks. A full dose of morphine and atropine was administered, and inhalations of ether resorted to, with digital manipulation of the gall-bladder, followed by hot poultices to the hypochondrium. Heat was also applied to the feet, which were cold. Draughts of hot water containing sodium bicarbonate were taken at intervals. Under this treatment the pain ameliorated after an hour, but soon became intense again, requiring the use of morphine and atropine, hypodermatically, at intervals. On October 6th, jaundice was more decided; stools were pipe-clay colored and urine high-colored. Pain was now very great, and inhalations of ether, manipulation of the gall-bladder and the abdomen seeming to have no effect in promoting extrusion of the stone, she expressed a willingness to have recourse to the oil. She had objected to it at first as, although the former dose had been followed by such prompt cessation of pain, it had been so intensely disagreeable to her, and so difficult to swallow and retain that I had not urged its use. But now, having determined to take it, she did so resolutely, swallowing three quarters of a pint containing a drachm of ether[1] without demurring. The oil was retained, and, to my gratification, pain ceased suddenly and absolutely within three-quarters of an hour. This was the first time I had used oil to relieve gall-stone colic, and though I had faith in the treatment and had formed a theory to account for its efficiency, I still felt no little surprise at the result.

The bowels moved freely, without a purgative, fourteen hours after the oil was taken. I had already begun a careful search for stones, using a sieve consisting of several thicknesses of cotton-netting of a very fine mesh. Every fecal evacuation after the date of my first visit was most thoroughly washed and filtered, and the scrutiny is still as carefully continued by the patient, who has a very intelligent idea of the matter, saving everything for my inspection which at all differs in appearance from the general semblance of fecal matter. The first three passages following the ingestion of the oil contained upward of fifty semi-solid lumps, of various sizes,

[1] The ether was added with the idea of assisting the retention of the oil, and also, of promoting a flow of pancreatic juice.

similar to those passed before. These I had no doubt were concretions of soap. A few were sent to Dr. Leffmann for analysis, who confirmed my opinion. In the third passage two gall-stones were found. One, unfortunately, on too rough handling broke into small bits and was lost. It had a similar appearance to the other, though it was a trifle smaller. This latter was about the size of a large pea, somewhat cubical in shape and of a brownish exterior. On light pressure with the finger it crumbled, showing a white, crystalline interior, presumably of pure cholesterin. Sulphuric acid, placed in contact with a small crumb, gave the play of prismatic colors. Another small portion was dissolved in boiling alcohol and the precipitate examined microscopically after evaporation of the spirits: the characteristic rhombic plates of cholesterin were shown. The remainder, quantitatively examined by Dr. Leffman, was found to consist wholly of cholesterin. The patient stated she found what appears to have been another stone, a few days later. It was globular in shape, and about three times the size of the one tested. As it fell into bits on her attempting to rewash it, and as she neglected to save the fragments, I failed to see it. Though some suspicious-looking concretions have been passed since, and brought for my inspection, none have answered to the tests for gall-stones or inspissated bile. The patient has had one or two slight attacks of colic since, but not severe enough to require medical interference. She is on appropriate hygienic and medical treatment to prevent the redevelopment of stones, and to bring about the solution of any remaining.

CASE II.—Mrs. C., aged forty-five, weight 225 pounds, of medium height, presented herself for treatment on October 23d, last. She had had paroxysmal, cramp-like pain in the epigastrium and the right hypochondrium, with flatulence and nausea, for several days. On questioning her, I learned that this was but a very light expression of similar seizures which had affected her for twelve years. The attacks appeared at intervals of from two years to two weeks, and lasted from a few hours to many days. In the past three or four years they had occurred more frequently than formerly, and were of several days'

duration. The shorter attacks usually occurred at night. Decided pruritus and jaundice were often present, after the pains had continued for three or four days. She was not aware that she was passing gall-stones, and had never been treated for them so far as she knew.

On examination, I found it difficult to outline distinctly the lower limit of liver dulness, because of the great amount of adipose tissue. It was, however, found to be extended, and the situation of the gall-bladder was exceedingly tender on pressure. Her diet and habits were regulated, and sodium bicarbonate and sulphate prescribed, to be taken in a bitter infusion a half hour before meals. An opiate mixture was ordered, in case the pains became too severe to be borne. She was carefully instructed how to search the passages for biliary concretions.

On the night of October 27th I was summoned to see her in well-developed hepatic colic. The slight pains had continued, with remissions and exacerbations, without growing very severe until the afternoon of that day, when suffering suddenly became so intense that she resorted to dose after dose of the opiate, entirely without relief, as, owing to the great gastric irritability, each was vomited as soon as swallowed. I gave, hypodermatically, a half grain of morphine and $\frac{1}{100}$ of atropine; applied heat to the feet, and afterward to the liver, first attempting digital manipulation of the abdomen in the region of the gall-bladder. Draughts of hot water, containing sodium bicarbonate and essence of peppermint, were also administered. Relief was soon felt, after which she fell into a broken sleep, to be thoroughly awakened, in the course of two hours, by the pains recurring as severe as before. Another half grain of morphine with $\frac{1}{100}$ of atropine was taken—this time by the mouth. This failing to give ease, and it being daylight, she sent for some cotton-seed oil, a full dose of which I had told her might tend to check the pains, should other remedies fail. I saw her at eleven that morning: she was then suffering very acutely. She had taken seven fluid-ounces of the oil at five, but had vomited it at once after it was swallowed. I persuaded her to take ten fluid-ounces while I was with her, adding a teaspoonful of ether to the dose, and administering a tablespoon-

ful of undiluted brandy immediately after. Emesis did not occur again for an hour: then about half the oil was ejected. Shortly before this, or, as nearly so as could be arrived at, forty-five minutes after taking the oil, the pain markedly diminished, and three hours later ceased entirely, indicating that a stone had been passed into the duodenum. A mercurial purge was taken on cessation of the pain, followed six hours later by two drachms of sodium sulphate in hot water. The bowels moved freely that night and the subsequent day, but no stones were found. Though great tenderness, on pressure, was felt over the lower margin of the liver, and especially above the situation of the gall-bladder, she remained entirely free from unprovoked pain for thirty-six hours. At the end of this period it recurred with great intensity. Feeling that the oil had been instrumental in checking it before, she was quite willing to resort to it again, if there was any chance of it being retained; as she constantly vomited all fluids swallowed, there seemed slight hope of this. It occurred to me that cocaine might aid in its retention. Thinking it worth a trial, I prescribed one-third of a grain, with ten minims each of compound tincture of cardamom and spirits of chloroform, in a tablespoonful of water, to be taken a half hour before the dose (a half pint) of oil; and directed that the oil contain a teaspoonful of ether, as before, and that a swallow of undiluted spirits follow the oil. On visiting her again a few hours later, I was told that vomiting had not occurred until three hours after taking the oil, and only then on attempting to swallow some meat broth. The vomit contained but little oil. It was also stated that the pain, which had been excessive, decidedly diminished within two hours after taking the oil, but did not cease entirely until seven hours later. Morphine was not resorted to during this attack. On its termination, the bowels were kept relaxed by calomel and sodium sulphate, and the feces searched in the most thorough manner—a forty-mesh wire sieve being used to wash them.

As I had directed that every particle passed of the slightest suspicious nature be saved for my inspection, the soapy concretions and all sorts of foreign substances, such as fruit seed, and concretions

evidently formed in the intestines from undigested food, were preserved and carefully tested, chemically and microscopically, when their nature was not apparent by inspection. On the fifth day after cessation of the last attack of colic, a triangular-shaped stone, about the size of a beechnut, was voided. It consisted of cholesterin with a nucleus of mucus and inspissated bile: the tests for these being applied by myself and confirmed by Dr. Leffmann. None has been found since, though the search is still being prosecuted with care.

This calculus, and especially the first one tested in the case of Mrs. K., had the smooth, eroded appearance of a biliary concretion that had undergone partial disintegration within the body. As neither of the cases had been under treatment directed to bring this about for more than a few days, it occurred to me that it might be due to some solvent action of a product of the decomposition of the oil. To determine if either soap or glycerin, when brought in contact with gall-stones, would have the tendency to promote softening of their mass and partial solution of their exterior, I took the halves of a very large and firm cholesterin stone, which I had removed two years before (*post mortem*) from a gall-bladder, and placed one in glycerin and the other in a strong solution of sodium soap, keeping both liquids at a temperature somewhat below the body heat, and noted the result in twelve hours. While the portion suspended in glycerin had remained firm in consistence and was altogether unchanged, that in the soap solution had stained the latter very decidedly and crumbled readily when taken between the fingers. This result is not surprising, when it is considered that soda is the alkali of the bile that tends to maintain cholesterin in solution, and that sodium salts, administered for long periods, in cases of cholelithiasis, have the tendency to promote dissolution of gall-stones and concretions of inspissated bile. This little experiment may, in a measure, account for the failure to find gall-stones where search has been properly made in cases of hepatic colic

treated by large doses of oil; for intestinal peristalsis, bringing the recently passed stones constantly into contact with warm solutions of soap, may, in some instances, cause their entire disintegration.

Although I do not claim to have fully demonstrated by the recital of these cases that oil is efficient in checking hepatic colic, since the length of time taken by the passage of a stone into the duodenum can never be exactly determined beforehand, yet I think that the prompt cessation of the attacks in Case I., in which oil was used, and in Case II., their less prompt yet really speedy discontinuance, in comparison with the duration of the last few previous seizures, when ordinary means of relief were tried, indicate, when placed with the accumulating evidence in favor of this treatment, that it is not without utility, and that it is at least worthy of intelligent and extended trial—especially when we reflect that none of the methods ordinarily resorted to have much influence in promoting extrusion of biliary concretions. A stone is probably passed into the bowel, through the action of the contractile muscular fibres of the duct in which it is contained, and the accumulation of liquid bile behind it, urging it along. Opium and belladonna in the full doses necessary to allay the pain of colic, and inhalations of ether and chloroform, tend to impede rather than assist expulsion, by arresting peristalsis in the duct. Opium and belladonna tend to retard, also, by checking the formamation and outflow of bile. It is true that dilatation of the duct is necessary for digital manipulation of the gall-bladder to be practised with success, yet few, save the most skilled, are able to apply this procedure properly. The abdomen of gall-stone subjects is usually so adipose that it is difficult to feel and still more to grasp the fundus of the gall-bladder, unless much distended—a condition unlikely to obtain unless a calculus has been some time impacted in the common bile duct.

If the theory suggested as to the action of the oil

is correct, the method, as now practised, is open to many sources of failure. Glycerin may not in all cases be formed in sufficient quantity to exert its peculiar effects. A free flow of pancreatic juice is necessary for the splitting up of the oil. The pancreatic juice may not be present in sufficient quantity to act on any amount of oil. Belladonna, or its alkaloid, atropine, much resorted to in hepatic colic, suppresses the pancreatic secretion. If full doses are given before oil is tried, the result will be *nil.* Any fluid taken with the oil may so dilute the glycerin formed in the duodenum that its hygroscopic effects on this part will be prevented. The calibre of the offending calculus may be too great to be influenced by the contractions of the duct and a full outflow of bile, induced by glycerin. If further trial justifies faith in the use of oil in the treatment of gall-stone colic, and my theory of its action is proved by experiment, some of these elements of failure may be removed.

The great objection to the use of oil is the difficulty patients have in swallowing and retaining it in the quantites ordinarily administered. The method practised in Case II. might be tried where considerable gastric irritability exists. Whether a less dose than half a pint will be efficient remains to be determined.

It would, I suppose, be useless to administer glycerin by the mouth with an idea of obtaining the result anticipated from the oil; for, because of the hygroscopic properties of glycerin, on which would depend its action, sufficient fluid would be absorbed from the gastric bloodvessels to render it too dilute to be efficient when it reached the duodenum.

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