THE AETIOLOGY OF GALL-STONES*

BY

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In spite of an enormous amount of clinical, experimental, and theoretical work the cause and methods of formation of gall-stones, upon which diagnosis and treatment must be based, have been fogged by the fact that all types of stone have been considered together, whereas there are several distinct types.

Cholesterol Stones

A pure cholesterol stone is single, oval in shape, up to 1/2-1 in. in its long diameter, nodular on the surface, semitransparent and waxy in appearance, light yellow in colour, and on section is amorphous in its outer layers but in the centre may show radiating crystals. If pure it is a light yellow (A 5),† but it may be tinted with bile (6). There is a variety which contains a certain amount of calcium, probably in the form of biliverdin or bilirubin calcium (7 B, C). In this case there are usually several stones.

Like all gall-stones the cholesterol stone is more common in women—the proportion being about 2.5 to 1—and some 80% of the women are married and have children. It is known that the function of the gall-bladder is to concentrate the bile to about one-tenth of its volume. There is a condition, generally known as a strawberry gall-bladder, which, on the apices of the papillary folds, shows masses of cholesterol or a lipid substance (37) that has been believed to be due to the deposition on or the absorption by the mucosa of cholesterol from a supersaturated solution. It is known that the blood cholesterol is increased in pregnancy, and this type of gall-bladder may be found in pregnancy and in eclampsia (38), and may even progress to the stage of forming papillary masses (39) which might separate to produce cholesterol stones.

For these reasons it has been believed by many—and especially by Aschoff and Bacmeister, who claimed that such stones could occur in gall-bladders entirely devoid of any inflammatory change—that these stones were metabolic. This has been accepted, almost without question, by many physicians, who argue that in many women the cholesterol is increased by pregnancy, and later by overeating and lethargy so that they are often over-weight, and that the gall-bladder concentrates the cholesterol and, the bile acids being reduced, the cholesterol is deposited from solution.

Nevertheless I am convinced that these arguments are fallacious. Sight is lost of the fact that the common age for gall-stones in women is 40 to 60, and of the total female population of this age, whether suffering from gall-stones or not, some 80% are married with children. Stones are rarely formed in the ducts, but when they are they consist of bile pigment and not of cholesterol, as they should be if deposited from a supersaturated solution, and this is true even in cases of obstruction of the duct by carcinoma of the pancreas or chronic pancreatitis. In such cases the bile is concentrated to a profound degree, so that it forms a tarry fluid which may be opaque to x rays, but pure cholesterol stones are then never found even in the gall-bladder. They are formed in the gall-bladder either when it is entirely cut off from the bile stream by the stone obstructing the duct (16) or in the distal cavity of an hour-glass gall-bladder (18). No bile is present, and therefore the stones cannot be

deposited from a supersaturated bile. They are never laid down as a primary crystalline mass, as they should be if deposited from a supersaturated solution, but are amorphous, although they may undergo secondary crystalline changes in the centre. They are completely insoluble in ether or olive oil although cholesterol crystals are freely soluble in such, but if they are finely crushed so that the organic matrix is broken up they become soluble. Therefore attempts which are sometimes made to remove small stones from the ducts by washing them out with ether are based on incorrect knowledge and are ineffective. In my own experience every cholesterol stone has been associated with cholecystitis, in some cases purulent (4). Therefore these stones are certainly not metabolic, but are formed by an inflamed gall-bladder.

Pigment Stones

Pure biliverdin calculi form small irregular friable masses of so dark a green that they are nearly black (9). They may be formed in the ducts or be found in the gall-bladder, and in the latter case may become coated with cholesterol (10); but this never happens in the ducts. The pure bilirubin stones are soft putty-like masses of a dark-brown colour. They may be found in relatively large cylindrical masses in the common duct in cases of cholangitis. If a mixed stone has passed down and become impacted in the common duct it may become covered with a layer of bilirubin, but the presence of a laminated centre will be proof that it originated in the gall-bladder. If such a stone is found after a cholecystectomy it must have been overlooked at the first operation, for a newly formed stone would consist of pigment throughout. They may also occur in the intrahepatic ducts, and are often deposited when there is a long-continued obstruction of the ducts and greatly concentrated bile. Like the biliverdin variety they may, if present in the gall-bladder, be coated with cholesterol (12 D). It is the pigment calculi which are found with extensive blood destruction—e.g., acholuric jaundice, malaria, etc. They are easily soluble and therefore often stain the mounting fluid. After removal of the cause they may become absorbed, even if in part covered with cholesterol in the gall-bladder, but in this case the pigment is alone dissolved and the cholesterol is untouched (22). They are therefore certainly metabolic in origin and due to deposition from a supersaturated solution.

Mixed Stones

These are often known as common gall-stones and they may be single or multiple. In the former case they may fill the gall-bladder and are oval in shape, with a surface that is nodular or mammillated from the impression of the mucosal folds (H). If the stone be large enough to obstruct the duct the portion in the duct will remain pigmented, but the greater mass in the gall-bladder will become coated with cholesterol and resemble a pure cholesterol calculus (16, 17). It is this large single stone which is most prone to ulcerate through the fundus into the duodenum, where it becomes coated with intestinal contents and may cause acute intestinal obstruction. If multiple they may be few and large (15), often then forming a chain of barrel-shaped stones filling the gall-bladder, or multiple even up to several hundreds, and may be loose or so numerous that they form a tight mosaic filling the gall-bladder (44). When multiple they are nearly always faceted, either because they fit into one another as they increase in size or because they rub upon each

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† The numbers in parenthesis refer to the List of Specimens given at the end of the paper.

other. They may be stained with biliverdin (E) or bilirubin (F), but in any one case the stones are all of one colour, although Bland-Sutton stated that the bile in herbivorous animals was red and in carnivorous animals green, and suggested that the colour might be dependent upon the diet. If few in number they are often of the same size, and it has therefore been suggested that they are all formed at one time (Rous) or that they may be grouped into several sizes and thus might be formed at a few critical periods (Lichtman); but in my experience they are most commonly of all sizes and might therefore be constantly forming. In my opinion there is little or no evidence that they are formed as the result of one transient episode.

One of their most marked characteristics is that they are laminated on section. In the centre the laminae may consist of radiating crystals, but the external layers are always amorphous. The different laminae may vary in colour but are usually alike. Like pure cholesterol stones they are insoluble in ether or olive oil unless crushed, and they have an organic matrix.

It is on the method of formation of these calculi that there has been so much controversy, the following views being held:

(a) Stagnation of Bile

This was one of the earliest theories of the cause of gall-stones (Galen, Frerichs, Rokitsansky, Aschoff and Bacmeister, etc.), and is still supported in many recent monographs and textbooks of medicine. It is believed that stasis without infection could lead to the precipitation of bile salts and cholesterol—a view that was considerably strengthened by the knowledge that in the gall-bladder the bile was concentrated to one-tenth of its volume. Stasis was believed to be more common in women because they wore corsets (but gall-stones have not become less frequent since tight lacing has been abandoned); because of the pressure from the pregnant uterus and later from the development of ptosis (but although the symptoms of ptosis may resemble those of gall-stones the two conditions are rarely found together); and because of their sedentary habits. Gall-stones, however, may be found in thin and active people. The supporters of this view have even blamed the wearing of a belt in men as a cause, but in most men the position of a belt has no relation to the position of the gall-bladder. The main argument against stasis being a causative factor is that this type of stone never occurs in conditions of profound stasis such as obstruction of the common duct—that, in fact, they are never formed in the ducts at all, and are not deposited as crystals, but are always amorphous, with an organic basis, and therefore are insoluble in ether and olive oil. As Robertson says: "Stasis, so useful in the laboratory test-tube experiment, is not the cause of gall-stones." Newman is more emphatic when he states that "stasis in itself is no explanation for anything."

(b) Metabolic Changes

In 1789 de Fourcroy discovered cholesterol and showed that it was a constituent of gall-stones. Since then many observers have claimed that cholesterol is increased in the blood during pregnancy, but it is not evident that this affected the cholesterol content of the bile. It was later shown that the removal of bile salts from the bile led to precipitation of the cholesterol, and Thudichum believed that fermentation of the bile caused a splitting of the bile acids and alkalis and so led to a precipitation of the cholesterol. The same arguments are as true here as in the case of pure cholesterol stones. They are never formed in the ducts, however concentrated the bile; they are never deposited as crystals; but, later, radiating crystals may be formed in the centre, and they are insoluble. It seems certain, therefore, that they are not due to deposition owing to metabolic changes.

(c) Constitutional Susceptibility

Several cases in my own practice have had a *family history*. In particular one girl of 18 whose bladder was full of stones had eight immediate relatives, including both parents and two grandparents, who had had gall-stones; but such a history is unusual. Stress has been laid upon the presence of a hereditary physical constitution (Draper), but most observers (Chaffard, Howard, Tucker, Bauer) have failed to obtain evidence in support of his conclusions. Even if a family history is obtained it is always possible, as in other diseases, that it might be due to a similar environment.

Association with Urinary Calculi.—The association of the two conditions has been believed in from very early times, but Robertson could find no evidence to support it, and states that the number of patients who harbour both types of stone has not proved large enough to justify the belief. Nevertheless in a series of cases I

investigated and reported over 30 years ago 80% of the patients with gall-stones had *B. coli* in their urine.

Association with Diabetes.—Many statistics have been published in support of the view that biliary calculi and diabetes were frequently associated. Bouchard found gall-stones in 10% of diabetics, and Jones places the incidence as high as 22%; but Naunyn and Kausch state that the combination is uncommon. Robertson in his masterly review† reports the results of 4,761 necropsies in patients over 20; 3,016 were males and 1,745 females. Gall-stones were present in 22% (500 men and 532 women). Diabetes was present in 205 of the total of 4,761. Of these, 76 (37%) had gall-stones, while of the 4,556 non-diabetics 956 (21%) had gall-stones. It is very probable, however, that the gall-stones have given rise to a pancreatitis and so caused the diabetes; for, as Robertson says, in nearly all cases the symptoms of gall-stones precede those of diabetes, and diabetes is not the cause of gall-stones.

Excessive Weight.—There is a general belief that gall-stones are more common in fat women, and that idleness, lethargy, and over-eating are the cause of increased cholesterol formation and the development of gall-stones. The experience at my own hospital supports the view that they are more common in fat Jewesses. Nevertheless it has been shown that there is very little evidence that increase of cholesterol in the blood is the cause of cholelithiasis, and stones often occur in thin people. Although Dublin, Gross, and Joslin, among others, have produced statistical evidence that sufferers from gall-stones are usually over weight, Robertson found in his 1,032 cases with gall-stones that 578 (56%) were of normal or subnormal weight. Even if they are more common in fat patients there is no more evidence that the fat caused the gall-stones than that the stones caused the fat.

Other Diseases.—Arteriosclerosis, gout, and tuberculosis have all been described as predisposing causes, but there is no evidence of any such relationship.

(d) Neurogenic Dysfunction

In recent years, when so much stress has been laid upon the nervous basis of disease, it is but natural that a neurogenic origin should be suggested for gall-stones. Westphal has perhaps been the strongest supporter of this view: he was able to demonstrate contractions of the gall-bladder with expulsion of the bile after mild irritation of the vagus, and relaxation with dilatation of the gall-bladder after stimulation of the splanchnic or sympathetic nerves. He and others claimed that in pregnancy a distension of this type occurred. This is, however, merely a variant of the theory of stasis, and the proof that such a dilatation, if present, is the cause of gall-stones is entirely wanting.

(e) Infection

The three main arguments against stasis and the metabolic origin of these and of pure cholesterol stones are that cholesterol is never laid down in the ducts; that it is deposited in the amorphous and never in the crystalline state; and that the stones are insoluble. Naunyn first asserted that cholesterol was not derived from the bile but was secreted by the epithelial cells of the gall-bladder and that cholesterosis of the bladder was similarly due to this secretion and not to absorption from the bile. He also showed that the newly deposited material was amorphous and not crystalline, and that there was always evidence of inflammation of the gall-bladder. Later he claimed that the *B. coli* was always present. Mignot pointed out that the infection was always chronic, and this indeed was to be expected, for in an acute infection of short duration, as revealed by operation or at necropsy, no stone would have had time to be formed.

It is of interest to note that even Hippocrates and Galen recognized the possibility of an organic basis, but it was not until 1684 that v. Heyde was able to extract the crystalline material from a urinary calculus and leave an organic basis. Ord laid stress upon the presence of a colloid, and Wells described what is now a well-recognized physical phenomenon—that crystalloids concentrate around the globules of a colloid, a process known as adsorption. There was at first a difficulty in accepting this explanation; for the colloid was believed to be mucus, but many failed to find it in the mucosa of the gall-bladder. Later Policard showed that the inflamed cells could take over the function of producing mucus. Many, however, regarded it simply as a binding or cement; but whereas the physical process of adsorption—where the crystalloid is deposited upon the surface of the globules of an irreversible colloid, probably owing to changes in surface tension—gives a ready explanation of the insolubility of a gall-stone in solvents of cholesterol, the mere presence of a cement does not.

Many have believed (Herxheimer, Collinson, etc.) that the presence of a nucleus was of prime importance, as there is a tendency for both colloids and crystalloids to precipitate around a central core. The nucleus is believed to be formed of clumps of bacteria, which

† *The Preponderance of Gallstones in Women*. H. E. Robertson. *Int. Abs. Surg.*, 80, No. 1, Jan., 1945, p. 1.

were first demonstrated by Gallippe, epithelial cells, or duct concretions. Moynihan's statement that every gall-stone is the tomb-stone of a dead bacterium has now become classical. Some have raised the objection that experimental or critical investigations have failed to demonstrate a nucleus, but the occasional presence of a silk suture (57) or a dead intestinal worm is a nucleus that is plain for all to see. It must be clearly understood that there is not a simple deposition of crystals around the nucleus but a process of adsorption.

The nature of the infection that leads to the secretion of mucin and cholesterol is probably very variable. When typhoid fever was endemic acute cholecystitis was common, and every surgeon is conversant with cases where gall-stones have followed typhoid. The patient is a typhoid carrier with *B. typhosus* in the stools, and after removal of the inflamed gall-bladder and stones (43) no more bacilli are passed and he ceases to be infectious. Although many writers have refused to accept the view of infection there can be no doubt that it is present in such cases. Hanot, and later Deaver, laid much stress upon the presence of the *B. typhosus*. Welsh has shown that coccal infections may act in a similar manner, and the work of Gordon-Taylor and Whitby demonstrating the presence of *B. coli* is known to you all. The greater liability of women to a systemic *B. coli* infection, especially during pregnancy, may account for their increased tendency to develop gall-stones.

Another factor upon which discussion has centred is the laminated structure of these stones. Many have compared them with other animal concretions, such as pearls, which have a similar organic matrix, or with mineral materials such as agates (1), or even with the world itself, and have regarded them as examples of the universal tendency in nature for the formation of alternating deposits of a different character; but the pure cholesterol stone does not show such lamination. The simple explanation, however, would seem to be that at times the stone obstructs the cystic duct so that pure cholesterol secreted by the bladder-wall can alone be laid down, while at other times the duct is free, bile can enter, and layers containing pigment are formed.

It would appear, therefore, to be beyond question that the stones are inflammatory in origin. Reacting to infection, the gall-bladder secretes the colloid mucin and the crystalloid cholesterol; a nucleus is formed of bacteria, epithelial cells, or, rarely, of a foreign body. If there be but one nucleus the stone is single, if multiple there are many stones. The crystalloid is deposited upon the colloid globules in an amorphous form by a process of adsorption, but later undergoes a secondary crystallization. If the cystic duct is permanently obstructed a pure cholesterol stone is formed (J), but if the obstruction is intermittent it is laminated. If the stones are multiple they are faceted either as they fit into one another as they are formed or by friction one against another. As the colloid is irreversible they cannot be dissolved or dispersed by any method of treatment.

Paths of Infection.—The next question that has given rise to controversy is the manner by which the infection reaches the gall-bladder. It was at first natural to assume that it passed up the duct from the intestine. Every surgeon, however, is aware of the fact that in the majority of cases of either acute or chronic cholecystitis the duct shows no sign of infection, and that when an infection is present a stone, laminated like those in the gall-bladder from the presence of cholesterol and which must therefore have been formed in the gall-bladder, is found in the duct. If its presence in the duct has caused a cholangitis a new layer is formed on the stone, but this always consists of pure bile pigment and never contains cholesterol. Moreover, there is an increasing volume of evidence that infection of any organ of the body—stomach, kidney, bladder, pancreas, etc.—rarely enters by the natural path or duct. It would seem that the protection against infection by this path is so efficient that it seldom breaks down. Moreover, stones rarely form when there is a partial obstruction and stasis in the duct such as occurs with carcinoma or chronic pancreatitis. This freedom of infection of the duct is evident from the fact that nearly all patients with gall-stones are completely cured by cholecystectomy.

The view that organisms might be absorbed from the intestinal wall into the portal vein and be excreted in the bile was attractive, for such organisms would very likely have an attenuated virulence and thus would more probably cause a chronic cholecystitis; but here again an infection of the ducts, the liver, and the portal vein would be evident, but it is generally absent.

A certain amount of evidence has been produced that the infection may spread directly or by means of the lymphatics from the liver, and Graham has pointed out that in nearly all cases there is some fibrosis of the adjacent liver; but it would appear more probable that the inflammatory change has spread from the gall-bladder, for it is limited to the area in close proximity to the gall-bladder and is never widespread in the liver.

Many investigators have been struck by the fact that in the presence of gall-stones the bile was often sterile. At first it was believed that the organisms, having initiated the formation of the stones, had died out and were present, either alive or dead, only in the centre of the stones. Since then much work has been done

showing that even if the bile is sterile organisms can be obtained from the gall-bladder wall. It is necessary to refer only to that of Illingworth and Wilkie, who obtained streptococci in this position, and of Gordon-Taylor and Whitby, who isolated the *B. coli*. The experimental work of Mann showing that the injection of formalin into the lateral ear vein of a rabbit was shortly followed by an acute cholecystitis seemed to prove that an infection could also take place through the systemic circulation. The claims of Rosenow, that his work demonstrated so marked a specificity of organisms that those removed from an infected gall-bladder and injected into the peripheral blood stream of an animal would in the majority of cases produce a cholecystitis, were attractive from this point of view. Many pathological specimens would support this idea. Specimen 43 is an example of a typhoid cholecystitis from a typhoid carrier in which there is gross fibrosis of the wall but only small calculi, suggesting that the primary infection must have been in the gall-bladder wall. Specimens of intramural calculi where the stones are in the mucosal crypts in the wall but none are present in the cavity (40, 40a, 40b), and of calculus formation around a silk suture in the fundus of the gall-bladder, are very suggestive (57).

One is therefore led to the conclusion that not only are these stones due to an infection, but this infection is carried to the gall-bladder wall through the systemic circulation.

Calcium Carbonate Stones

The most interesting stones, and the kind most difficult of explanation, are those formed of pure calcium carbonate. In the fascinating book *Gall-stones*, written by the late Sir John Bland-Sutton in the early years of this century, the author states that he knew of only two such cases, but since then I have been able to collect five from my own practice, which are now in the museum of the London Hospital. They may occur in two forms, one of which consists of well-formed extremely hard calculi that are spherical, with a nodular surface. They are generally small and relatively few in number (19), but in one remarkable specimen (20) there were 11 stones in the gall-bladder and 28 in the common duct. The yellowish-white colour and the nodular appearance give them a close resemblance to pigment stones which have become covered with cholesterol in the gall-bladder. In fact, in the specimen I so mistook them until I attempted to cut one to demonstrate the pigment centre and broke a piece out of the knife. The other variety consists not of a formed stone but of a thick white paste resembling unset plaster-of-Paris, which may fill the gall-bladder (21) and have embedded in it one or two mixed gall-stones. Specimen 21a is an example. The pure calcium carbonate gives, of course, a deep x-ray shadow, and in this case the cavity of the gall-bladder was well outlined as though dye had been administered, with two negative shadows due to the stones. When it was known that no dye had been given the diagnosis was certain.

The reason for the formation of these rare stones is very difficult to understand. Elsewhere in the body the deposition of calcium carbonate is indicative of a very slow and chronic inflammation of connective tissue, and hence it would be expected that the gall-bladder would show a very chronic change, with destruction of the mucosa; but although this is true of calcification of the gall-bladder wall it is not the case with calcium carbonate stones. In one specimen (24) a typical deposit of soft material was formed in a case of alcoholic jaundice where pure pigment stones would have been expected. In none of my cases was there any evidence of hyperparathyroidism. At present I must confess that I have no explanation to offer for this unusual phenomenon.

Conclusion

I trust that I have been able to show that there is still much of interest to be learnt from the everyday experiences of surgery, and that to those of a curious and inquiring mind there are still big fields of research in the observations of gross pathology.

LIST OF SPECIMENS REFERRED TO IN THE TEXT

- A 5. Pure cholesterol stones.
6. Pigmented cholesterol stone.
- 7, B, C. " " with calcium carbonate.
37. Strawberry gall-bladder.
38. " " " in eclampsia.
39. " " " with papillary masses.
- 16, 17. Cholesterol covering stones, with obstructed duct.
18. Cholesterol covering stones in distal pouch of hour-glass gall-bladder.

4. Cholesterol stone associated with acute purulent cholecystitis.
9. Pure biliverdin stones.
10. " " " coated with cholesterol.
12. D. Bilirubin stones coated with cholesterol.
22. Partly absorbed stones.
- H. Large single stone in gall-bladder.
15. Barrel-shaped stones.
44. Mosaic of gall-stones in gall-bladder.
- E. Multiple-faceted biliverdin stones.
- F. " " bilirubin "
43. Typhoid cholecystitis.
1. Agate showing lamination.
- J. Laminated stone covered with cholesterol.
- 40, 40a, 40b. Intramural calculi.
57. Recurrent stones formed round silk sutures.
19. Small calcium carbonate stones.
20. Large " " "
21. Putty-like mass of calcium carbonate.
- 21a. " " " " " with common stones.
24. " " " " " " from case of acholuric jaundice.

ON "ACROPARAESTHESIA" AND SO-CALLED "NEURITIS" OF THE HANDS AND ARMS IN WOMEN

THEIR PROBABLE RELATION TO BRACHIAL PLEXUS PRESSURE BY NORMAL FIRST RIBS

BY

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During the past four years I have seen an unusual number of cases in which the presenting symptoms have been numbness, tingling, and "uselessness" of the hands and fingers in women, often associated with severe pain and a variable degree of disability. By the time such patients reach the neurologist they have usually been given prolonged, various, and largely ineffective treatments. It is improbable that my experience in this matter is unique, but since there is clearly general uncertainty as to the aetiology and nature of the condition and as to the means of dealing with it effectively, a short account and some suggestions as to its causation may not be amiss.

I have said that the patients are women, but the incidence of the syndrome may be still further restricted. The sufferers fall into two main categories. The most numerous are middle-aged or elderly women, normally unaccustomed to full housework or other forms of manual effort, who, under wartime circumstances, have been obliged to undertake the entire work of their homes with all that this involves in the preparing of food and meals, cleaning, shopping, standing in queues, and the carrying of heavy shopping baskets. The second category is composed of younger women who, in addition to the not light tasks enumerated, have also done part-time work in industry, or have had the burden of childbirth and the care of young children.

In both categories the history has the following characteristic features. The symptoms have been gradual in onset and consist of intense sensations of numbness and tingling in hands and digits. These are greatest on waking in the morning, when they make the fingers clumsy and weak. By the time the patient has dressed, the symptoms have lessened and hands and fingers regain much of their dexterity. Nevertheless, they remain uncomfortable and less than normally nimble all day, and in the evening, when the major burden of the day's work is over, the symptoms increase again. During the night pain and paraesthesiae in the fingers may awake the patient, the pain being of a burning character. The subject may have to adopt various measures to secure relief: getting up and walking about, putting the arms over the edge of the bed, or placing them upon the pillow above her head. In yet other instances the night is the period of relief. An unusually hard day's work aggravates the symptoms, while such tasks as ironing, washing, and the carrying of heavy baskets are especially provocative of severe accesses of pain and numbness.

After some weeks or months the symptom-complex reaches its maximum, and thereafter fluctuates in severity and disabling quality from patient to patient. It varies also from time to time according to the patient's general health and state of

fatigue. Pregnancy and the care of the child after confinement undoubtedly aggravate the condition.

The response to the treatments commonly adopted is uniformly disappointing, for whatever the mode of therapy the patient is commonly expected to remain ambulant and to follow her normal routine of life. The sage-maxims of Hilton in the matter of rest are forgotten, and find an ineffective substitute in injections of vitamin B₁, the oral administration of vitamin combinations, and diverse forms of physiotherapy. The patient is treated by what is thought to be science, and certainly not by anything that can be called the art of medicine. In middle-aged women, of course, the oestrogens are invoked with no fruit, and when the desperate patient has sought relief from practitioners not on the *Medical Register* "manipulation of the spine" has still further added to her torments.

A few of the sufferers have discovered for themselves that a rest or holiday affords remarkable relief, but the fact provides a clue that no one is interested to follow to its logical conclusion—namely, that it suggests a mechanical origin of the syndrome.

On examination the subject is commonly found to show the general indications of chronic fatigue, and indeed the sense of fatigue may be one of her bitterest complaints. The musculature is atonic; often the shoulder girdles are set notably low, so that the line of the clavicle as this is followed out from the sternal end is almost if not quite horizontal. It is known that this state of affairs—a progressive lowering of the shoulder girdle—is the rule in women as middle age is reached and passed, and it is therefore not always clear that this sagging is beyond the limits of the normal; but my own impression is that this is commonly so in these cases. In a proportion of them traction on the dependent arm obliterates the radial pulse, though this is not constant, and may indeed be found in persons who are symptomless.

There is no muscular wasting, but almost always marked tenderness of the extensor muscles in the forearm, and sometimes of the thenar and adductor muscles of the thumb. Objective sensory loss is exceptional, though when pain and paraesthesiae are maximal there may be some blunting of cutaneous sensibility over the digits. Cyanosis or pallor of the fingers is occasional, but Raynaud's syndrome is no essential part of the picture. The pain and discomfort and the muscle tenderness may lead to some apparent weakness of grasp and to notable clumsiness of finger movements. Radiography reveals no abnormality except the lowering of the outer end of the clavicle already alluded to, but of course an occasional case of cervical rib is revealed in this way.

In brief, the condition is one in which subjective symptoms predominate or exist alone and objective signs are scanty.

The syndrome is not unfamiliar to clinicians, but what is new is its widespread incidence. Formerly confined to women habitually doing heavy work, such as washerwomen, it is now found throughout the social scale. One other point may be made at this juncture, in anticipation of what is to be said of treatment—namely, that the symptoms characteristically respond to rest, but not to any other modes of treatment unless rest accompanies them, when it may be suggested that they are superfluous and inoperative.

Aetiology

The condition thus briefly described is the one familiar to us under the uninformative title of "acroparaesthesia." In textbooks of medicine it finds cursory mention among vascular diseases and is described as a vasomotor neurosis—a meaningless term that is nowhere defined, and one for the use of which no reasons are offered. Authors stress the absence of objective signs, and agree that it is bilateral and common in middle-aged women, in debilitated subjects, and—by way of a parting shot—in those who are emotionally unstable.

Treatment is generally allowed to be unsatisfactory, and includes radiant heat, massage, ionization, diathermy, thyroid extract, calcium of course, bromides, salicylates, and vitamins. Not one of these remedies but has been described as useless by some writers, valuable by others. No one can doubt that the syndrome will shortly be conscripted into the swelling ranks of so-called psychosomatic disorders, from which it will with difficulty be rescued for medicine proper.