

## ON RETRACTION AND VISCOSITY OF THE UTERUS.

By WILLIAM STEPHENSON, M.D.,  
Professor of Midwifery in the University of Aberdeen.

A CLEARER and more accurate conception of the uterus as a muscle is requisite before many important questions in midwifery can be satisfactorily settled. Not only is our knowledge of the subject deficient, but our ideas are confused, and our modes of expression loose and ambiguous.

There is but one idea that has hitherto governed our conceptions of the phenomena of uterine action, that is, muscular contraction. Throughout pregnancy and in labour we recognise rhythmic contraction followed by relaxation. When the uterine contents have been expelled we see contraction without relaxation; the uterus is said then to be "permanently contracted." By frozen sections of the parturient uterus a thickened portion of the walls is discovered, and is designated "contraction ring." When hæmorrhage occurs after labour all our efforts are directed to procure contraction. The idea is simple but it is not sufficient. During labour at times we meet with contraction without relaxation; when labour is over we are told there is "persistent contraction of the muscular fibre after contraction has ceased," and we are all familiar with contractions occurring in the already "permanently contracted uterus." The so-called "contraction ring" persists after death when no contraction can take place. On contraction men rely to check bleeding, and yet contractions last but a minute, and hæmorrhage is often absent though the uterus is flaccid.

There is thus much confusion of ideas in the use of this one word "contraction" when speaking of uterine action, and to obviate this the term "retraction" has been introduced. It would be more precise, and therefore more scientific, to confine the use of the term "contraction" to its strict physiological meaning, that is, the temporary shortening of a muscle under discharge, and carefully to cultivate the use of the word "retraction" whenever permanent shortening of muscle is spoken of. Such distinctive use of terms is essential, and will be strictly carried out in this paper. The distinction, however, has not yet been adopted with sufficient care by writers. It requires much schooling of the mind to get rid of the wrong use of a familiar term.

This meaning of the term retraction is accepted by all—the shortening of the fibres that remains after the uterine contents have been expelled. But diversity of opinion at once arises when the reason of the shortening is included. Some hold "that retraction is a mere retention of part of the ground gained by contraction," "that without contraction there can be no retraction," and that "retraction is contraction and something more." Others, again, assert that the action is different and distinct from contraction; that the uterus may shrink independently of contraction; that there is a force of retraction distinct from that of contraction.<sup>1</sup>

Here, then, is diversity of opinion which it is desirable should be removed. Can we realise retraction as distinct from and independent of contraction? If so, what is the nature of the force? Under what conditions is it affected?

When the muscular tissue of the uterus alone is considered, it is difficult to satisfy the mind that a given shortening of the fibres has been produced independently of contraction, and that a discharge has not by some means been excited. When we feel the uterus diminishing in size under our hand, how can we believe it is not contracting? As Dr. Matthews Duncan remarks: "It is certain contraction does not necessarily imply retraction. That retraction is not dependent on contraction is difficult to prove." But there is a way out of the difficulty, and that is to exclude for the time being all muscular tissue from the problem. This was done in the previous paper on "Certain Obstetric Aspects of the Pelvic Peritoneum."<sup>2</sup> I therein pointed out that the serous coat of

the uterus at the end of labour manifested the phenomenon of retraction in a marked degree; that it possesses the property of shrinking in a perfect manner; that to produce the shrinking there must be definite tension of the membrane, and that that tension is dependent upon the molecular forces resident in the tissue. If, then, we admit that a non-muscular tissue composing part of the uterine wall has an independent property of retraction, there is no reason why we should deny to the muscular portion, under like circumstances, the same property. We can in this way realise retraction as a function of the muscular walls distinct from contraction. Contraction belongs to muscular tissue alone; retraction is a property common to muscle and peritoneum.

The property of retraction, therefore, is, I hold, a distinct function of the uterine walls, independent of that of contraction, having its origin in the molecular forces resident in the tissues, whereby, when freed from the expanding force—that is, the bulk of the contents—the structure tends to assume the form which presents the smallest superficies consistent with the conditions; in other words, it shrinks, and that independently of contraction.

This property resembles in its action that of elasticity, but, as was shown in the previous paper, it is different in its nature, and must not be confounded with ordinary elasticity. It is, moreover, like contractility, a purely vital phenomenon; but, nevertheless, that does not prevent us from conceiving that it is due to the mutual action of the molecules upon one another, similar to that which produces the phenomena of molecular tension in many inorganic substances. With the above reservation we may think of retraction as due to the vital elasticity of the tissues or to their molecular tension. Meanwhile, it is better not to complicate the subject by discussing whether or not this property is what physiologists speak of as "tonus." Sufficient for our purpose that it is the capacity to shrink in the same sense as we see displayed in a non-muscular tissue, and therefore may be independent of "contraction."

Such a force explains the continuous internal uterine pressure. By it we can understand the permanent lessening of the cavity in proportion as the bulk of the contents are diminished. It is the sole cause of the permanent shortening of the fibres, for after contraction alone (retraction being absent), we must always admit relaxation and the capability of resuming their original length.

Retraction is not an expulsive force, except so far as fluids unconfined are concerned. After rupture of the membranes, the internal uterine pressure may expel some liquor amnii, but it cannot expel a solid—not even a clot of blood.

From the revelations of frozen sections of the parturient uterus, it is evident that under retraction alone the uterine walls gather themselves around, and are moulded to the uterine contents, be they child, placenta, or clot. Dr. Free-land Barbour has lately drawn attention to this important fact, that the internal surface of the retracted uterus presents an accurate mould of the contents—an observation well worthy of consideration.

This behaviour of the uterine walls, like a plastic substance, cannot be explained by the common ideas of contraction or retraction. It suggests to the mind the same property which in the previous paper I pointed out was possessed by the uterine peritoneum—that of viscosity. The introduction of this idea is necessary to complete our conception of the uterus, and is essential to the explanation of all the phenomena.

The ordinary idea associated with viscosity enables us to understand the plastic behaviour of the uterus in forming a mould of its contents, and explains the differences in the thickness of the walls at different parts, and the irregularity of the internal surface as contrasted with the smooth and regular outline of the external surface. The term, however, has another and different application. The essential idea of viscosity is the nature of the resistance offered to a change of form,<sup>3</sup> and has recently been employed to denote the retardation of elastic recovery in solids which is displayed by even the most elastic of bodies. It is otherwise spoken of as the "fatigue of elasticity." The greater the viscosity the longer is the time required for the elastic body to regain perfectly its original shape after a deformation. Viscous

<sup>1</sup> See paper by Matthews Duncan, and discussion thereon, *Obstet. Trans.*, London, 1886.

<sup>2</sup> BRITISH MEDICAL JOURNAL, March 26th, 1892, p. 645.

<sup>3</sup> *Op. cit.*, p. 646.

resistance retards the action of elasticity, just as any ordinary force is retarded by friction—in fact, it is spoken of as molecular friction.

Now, in our conception of retraction it is essential to realise that the shrinking of the uterine walls is probably always, and certainly at times, a gradual process, and, compared with contraction, is slow. Retraction does not necessarily follow close on the heels of contraction. It is a persistent force, and acts when unrestrained in the intervals between the contractions. The action is gradual, and is retarded in proportion to the amount of viscous resistance in the tissues. It is with and because of the diminution in the bulk of the contents that retraction occurs, but, even when the uterus has been emptied, some time elapses before retraction is complete. This is well illustrated in the condition of the uterus immediately after the expulsion of the placenta. The contraction which has completed the third stage passes off, permitting of partial relaxation of the walls until retraction is complete—and every practitioner knows that it is some time before that is the case and before the uterus can with safety be left to itself.

At present I have dealt with retraction as relating to actual labour only, and reserve for future consideration the question what part it may take in the production of the changes which occur in the preliminary stage of parturition.

There are, then, three properties to be recognised in the uterus, and when we realise the distinctive nature of each, and keep them in our minds separate one from another, we can understand the part that each one plays, and we obtain a conception of the uterus which satisfactorily explains many of the phenomena met with in pregnancy and labour.

First there is Muscular Contraction, the result of the energy rendered kinetic by a stimulus. It is powerful but intermittent, lasting only for a comparatively short time. It is resident in the muscular tissue alone, and causes only a temporary shortening of the fibres; so soon as the contraction has ceased the fibres are capable of returning to their original length. The force so derived is the only one that can reduce the bulk of or expel the solid contents of the uterus.

Secondly, the Molecular Tension of the tissues, whereby, when free from disturbing influences, they constantly tend to assume the smallest superficies consistent with the conditions. This property belongs to the serous as well as muscular coat. The energy differs from that of contraction in being feeble but persistent, and from that of ordinary elasticity in being always the same in amount however much or little the tissues are expanded. It gives rise to the continuous internal uterine pressure. It alone is the cause of the permanent diminution in the superficies of the uterine walls. It is not an expulsive force except in so far as fluids free to move are concerned; it may express some liquor amnii but cannot expel a clot of blood. Under its influence, contraction being absent, it gathers the walls around the uterine contents.

And thirdly there is the Viscosity of the uterus. It offers resistance to a rapidly dilating force, and explains the unlimited yielding without rupture to a small but persistent force. It retards and for a time renders the action of retraction imperfect. Through it the internal surface under retraction presents a true mould of the contents.

Further, to complete our conception of the uterus, we must remember that, whatever be the condition of the muscular fibres, they are surrounded by, and are closely attached to a serous membrane, which possesses the same property of molecular tension, and which evidently acts as an elastic capsule, offering resistance to any dilating force, and aiding in the establishment of perfect retraction.

This conception of the uterus enables us to understand various phenomena that the older views failed to explain. In Cæsarean section, whenever the child is lifted out, the uterus retracts at once, often grasping a part of the fœtus. Here it may be objected that the manipulation supplies the necessary stimulus for contraction in a uterus ready to act. In ordinary labour, however, we at times meet with cases where the uterus has become exhausted, and all our endeavours have failed to excite contraction. Nevertheless, on artificial delivery, by means of turning or the forceps, the uterus, though previously inert, follows down the diminishing bulk of the contents, and

retraction, though slow, is soon complete. This immediate response of a fatigued uterus always was a puzzle to me so long as I thought of contraction only, or that retraction is dependent upon contraction.

When the hand is passed into the uterus to remove the placenta, we find it may remain for some time in the cavity without exciting a contraction, but, the moment the hand is being withdrawn, the walls can be felt to retract, and the cavity to become obliterated. This is retraction simple in an empty uterus, not contraction.

Further confirmation of the truth and value of these views is obtained by observing the uterus immediately after the expulsion of the placenta. The contraction which has completed the labour soon passes off. By the hand externally one becomes conscious that the organ is less hard, and enlarges somewhat. What now is the condition of the organ? Contraction has ceased, the muscular fibres are relaxing and are capable of yielding to an expanding force. The only such force present is blood pressure, which, if no counteracting force be present, will refill the sinuses, the blood will escape into the uterine cavity, and further distend the organ. The counteracting force is the molecular tension of the tissues, not of the muscular fibres alone, but of the serous coat as well, producing retraction. Normally the shrinking is sufficiently complete to prevent any marked distension; but, under special conditions, the action is retarded by viscous resistance, and, if a fresh contraction does not come to the rescue, the muscular walls and cavity become filled with blood. As Matthews Duncan has remarked, "it is retraction, and retraction alone that is a safeguard against hæmorrhage."

The whole subject of the management of the third stage of labour and the treatment of *post-partum* hæmorrhage will fall to be re-examined under the view of the distinct and independent action of contraction and retraction. Fresh lines of inquiry are opened up as to the causes which affect the one and the other. Does frequent or long-continued contraction increase the viscosity, and so retard the action of the molecular tension? How far is the latter force increased or diminished by heat or cold? What is the true action of ergot? What is the influence of chloroform and chloral on the tension as distinguished from the irritability of muscular fibre? These and other problems demand fresh inquiry that will require time for careful investigation. Meanwhile it should be always borne in mind that the science of midwifery can be advanced, not only by the discovery of new truths, but also by clearing our knowledge of the encumbrance of unscientific methods of thought and ambiguous modes of expression.

## NEURALGIA OF THE HEART, AFTER INFLUENZA, WITH A FATAL CASE.

By ST. CLAIR THOMSON, M.D. LOND., M.R.C.P. LOND.,  
Florence.

AMONGST the various complications of influenza, some of the most alarming are those connected with the heart. I do not refer to lesions of the valves, but to affections which appear to depend on the bulb and the nervous regulating mechanism. The three following cases occurred in well-to-do patients who were able to take the greatest care of themselves from the first; there was no exposure to weather after the first manifestations of the influenza; there was no other complication beyond that of the heart, and in no case was there a cardiac organic lesion. All three were alarming in appearance, and one was fatal in its ending.

CASE I.—An American gentleman, aged 39, had lived in Italy for some years. Did not have the influenza during its visitation two years ago. He was stout, took little active exercise, and was an inveterate smoker, consuming at least ten strong cigars per day. He sent for me simply to know if he had had the influenza, as he felt fairly well, and complained of nothing but weakness. From the description of his fever and aches during the previous days I said he probably had had an attack, and must remain indoors for some days. There was no fever, but I noticed that the pulse was slow, small, compressible, and with an occasional intermission. The heart's sounds were normal; there was no cardiac pain. A preparation of caffeine and quinine was given. That evening the patient had a return of fever, and next morning I found the temperature 100°. This second attack of fever quickly subsided under salicin. The pulse fell to 56, but under digitalis became regular. The patient was allowed up, but confined to the house, and advised to keep quiet