

THE HYPOTHETICAL PATHOGENETIC ROLE OF INHIBITION OF PLEASURE AND MUSCULAR TENSION IN UTERINE FIBROMA¹

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Summary.—In the framework of a psychophysiological integrated model of emotion, inhibition, and their linked role in developing pathology, we have examined some physiological and psychological aspects of 17 volunteer women with uterine fibromatosis and 14 women without pathology. The hypothesis was that women with uterine fibromatosis habitually inhibit the subjective feeling of pleasure during the sexual sequence, measured on a self-rating scale. Following the psychophysiological model of Ruggieri, the inhibitory mechanism would be actively produced by modulating the muscular tonic activity in particular of the rectus of the abdomen whose bio-electrical activity is measured at rest. The patients with uterine fibromatosis presented more elevated muscular tension than controls and less intense pleasure felt during the sexual sequence. Discussion of the data considered also the possibility that the muscular tension of the abdominal wall would play a role through reflex mechanisms (somatovisceral reflexes) in developing pathology.

This research contributes to the study of hypothetical psychosomatic components of uterine fibroma. The psychophysiological integrated model (Ruggieri, 1988) applied in psychosomatic pathology differentiates from other psychological and psychophysiological theories (psychoanalytic oriented, behavioristic, etc.) in focussing physiological and physiopathological mechanisms of inhibition of emotions. The central hypothesis of this theory is that inhibition of emotion could be the basis for *developing* pathology. But to understand the physiological mechanisms of inhibition it is absolutely necessary, we think, to have (a) a clear physiological model of emotion, (b) a physiological hypothesis about “how” the inhibitory mechanisms act on emotions, and (c) a description, always in physiological terms, of the passage “from inhibition” to some forms of pathology. Because each part of this psychosomatic model, although elaborated about ten years ago (Ruggieri, 1988) is not widely known, a detailed presentation of each hypothetical point would be useful. For a deeper discussion see Ruggieri’s (1988) work wherein are presented the model of emotion (pp. 2-127), the model of inhibition (pp. 131-157), the relationship between sexual pleasure and pathology (pp. 195-217), and the psychophysiological pathogenic model (pp. 227-249).

Emotion

The first step is represented by the psychophysiological description of

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emotion. Our model (Ruggieri, 1988) could be considered a deep revision of the James-Lange theory with some important conceptual integrations. Emotion could be considered a *complex pattern of response* elicited by "emotional stimuli" (external or internal self-evoked). The pattern of response is produced by some specific centers of the central nervous system (hypothalamus, limbic system, etc.). These centers elaborate a programmed pattern to be realized by the autonomic and somatic (muscular) systems of the organism involving also (but not only) the mimic expressive musculature of the face. The pattern of emotion is also characterized by increasing of excitation (arousal-activation) and a subjective feeling of pleasure or displeasure. This last aspect is the principal one; without subjective feeling, emotion does not exist. These three components, i.e., somatic and vegetative activity, arousal activation, and subjective feeling are strictly related to each other. To understand the relationship between emotion and arousal-activation we consider emotion in a wide psychological, ethological, and relational context. In previous work (Ruggieri, 1988), emotion could be considered, in many cases, as a preparatory phase (appetitive phase) of an instinctive behavior. It is possible to consider the instinctual behavior as composed of two phases, appetitive and consummatory (Moruzzi, 1973). For example, the instinctual behavior "aggression" is composed of two phases, rage and attack.

"Rage" could be considered as a preparatory phase of the so-called "consummatory" behavior (attack). The preparatory phase (appetitive), we think, is always characterized by a particular form of muscular tonic activity that could facilitate the onset of the following phase. For example, muscular tension (increasing tone) or isometric contraction (muscular contraction without shortening the muscles) of rage could be considered as a muscular preparatory phase facilitating the muscular contractions of the gestures involved in the behavior "attack." This increasing of muscular tension of the emotions corresponds also to the concept of activation expressed by Pribram and McGuinness (1975) that distinguished between arousal and activation. Arousal is related to the analysis of input; activation is linked to the readiness of response.

We developed the Pribram concept of activation, hypothesizing a real increasing of muscular tension, as happens in sport, when the athlete is in the phase "ready to go" (Ruggieri, 1984, 1988). The emotional state would be characterized by an increase in activation. But the central point of the hypothesis is that increasing muscular tone or isometric contraction elicited by the encephalic centers in response to emotional stimuli is the basis through feed-back reafferentations of the *subjective perception of tension* and of the *feeling characterizing the emotion*. In fact, we consider emotion also as a "self-signal."

The experience of tension (directly related to the muscular tension)

would be present in many emotions with different combinations with vegetative activities. For example, in the emotion "rage" there would be a combination of muscular tension and vasoconstriction of the vessels of the skin with a reduction of the cutaneous temperature. On the contrary, in the sexual sequence the muscular tension is associated with vasodilation of the vessels of the skin with increase in cutaneous temperature. The proprioceptive (muscular tension) and vegetative activity through reafferentation pathways represent the information that the central nervous system synthesizes in producing the subjective experience of feeling rage and of pleasure, respectively.

Pleasure and Sexual Behavior

In the psychological literature, categorial and dimensional aspects of emotion (Izard, 1977; Plutchik, 1994) are distinguished. For the psychophysiological model of emotion, subjective feeling is the principal component; also sexual instinctual behavior, for the presence of feeling pleasure, could be considered as an emotional process. Sexual behavior has preparatory and consummatory phases. In previous researches (Ruggieri, Calzaretta, Milizia, Rocchetto, & Sabatini, 1985; Ruggieri, Milizia, & Angeli, 1985; Ruggieri, *et al.*, 1986; Ruggieri, Guaia, & Sabatini, 1987) we examined some aspects of the subjective feeling of pleasure during sexual behavior and observed the presence of two forms. The first (the appetitive phase) is characterized by an increase in tension or muscular and subjective feeling of tension and, the second, the orgasmic phase, is related to a strong reduction of tension through the intense muscular contraction and the vegetative expulsive and secretory activity of the orgasmic phase.

We observed also that subjects localized the sources of pleasurable tension in many areas of the body. During the sexual sequence tension develops from the genital areas to the whole body. In this context of researches we observed also that different groups of patients with different forms of pathology showed differences in subjective pleasure felt during the sexual sequence. They presented also differences in the localization of the sensation of tension in the body. Interesting was the fact that some groups of patients felt lack of tension in many areas (Ruggieri, Calzaretta, Milizia, Rocchetto, & Sabatini, 1985; Ruggieri, Milizia, & Angeli, 1985; Ruggieri, 1986; Ruggieri, Guaia, & Sabatini, 1987). We interpreted the results by hypothesizing that some subjects (or groups of subjects) inhibit the production of bodily modifications that would be the basis of the experience of pleasure. But to interpret this phenomenon we must describe our psychophysiological model of inhibition (Ruggieri, 1988).

Model of Inhibition

The most studied neurophysiological mechanisms of inhibition are the neuronal synapses of the central nervous system. We underlined (Ruggieri,

1988) a further mechanism which, in a circular way, involves not only the central nervous system but also the periphery of the body. In other words, the central nervous system could elicit at the periphery of the body a particular activity which plays an inhibitory role, through a feedback mechanism.

A similar mechanism is well known in the inhibition of the secretion of hormones. High levels of hormones in the blood inhibit the activity of the centers that stimulate the production of hormones. In our model this mechanism is applied to the activity of muscles hypothesized as structural components of instinctual and emotional behavior. The question is how is it possible to stop an emotion (partially or completely), i.e., rage, or an instinctual behavior, i.e., attack, when the neural programme through the efferent fibres reaches the periphery of the body or when an hypothetical increase in muscular tension (as in rage) or a motor sequence of muscular isotonic contractions (as in attack) are present. There are two different hypothesized mechanisms. The first produces a conflict between two motor patterns. In case of attack the subject could inhibit his gestures, producing simultaneously a motor pattern which antagonizes the instinctual one. Assume in the aggressive gesture some muscles are involved, and the subject stimulates simultaneously other muscles antagonistic to the activity of those in the aggressive gesture. If the activity of the two groups of muscles is counterbalanced, the isotonic contraction of one group is impossible. The result is relative immobility and increasing muscular tension (isometric contraction). On the basis of these modifications the subject could have a subjective feeling of tension. The same feeling is present during the concrete experience of rage, linked to increased muscular tone or isometric contraction.

The second inhibitory mechanism is represented by a muscular contracture, i.e., a muscular contraction not followed by relaxation. This second mechanism can be also related to the first. It is possible to hypothesize (Ruggieri, 1988) that the experience of tension could be reduced by the muscular contracture of one group of muscles. In other words, if the subject is not able to remove the causes (external or internal stimuli) evoking emotion and instinctual behavior a chronic contraction is produced. The chronic muscular contraction could reduce the subjective feeling of tension and inhibit the development and the realization of the instinctual behavior.

The muscular contracture should have a complex physiological role in (1) hindering the sequences of contractions and relaxations that characterize the motoric activity of rage-aggression. In other words, the realization of the programme of the instinctual aggressive behavior would be blocked at one point in the sequence, (2) possibly acting also as a feed-back "stop" mechanism. In this process the contracture, i.e., muscular contraction not followed by relaxation, signals to the central nervous system the maximal possible activity of a somatic area, and (3) produces also a reduction or a total disap-

pearance of the subjective feeling generated by the muscular tension. Some psychophysiological clinical observation showed also in so-called normal subjects, the presence of chronic contracture in different areas of the body.

Often the contraction involves only few muscles or few motor units of the muscle. Clinical psychologists have often observed, after removing the contraction with different psychological techniques, the appearance of emotional patterns, i.e., crying or rage. Analyzing this experience, it is easy to hypothesize that the contraction controls the emotional pattern through retroactive inhibitory mechanisms. In this way, the emotional pattern does not disappear but is fixed in one phase of development. We hypothesize that the *muscular inhibitory mechanism could be applied also to the sexual pattern.*

From Inhibition to Pathology

Now we hypothesize that a muscular contraction, interacting with other pathogenic factors, could play a role in the development of some form of pathology. In previous researches (Ruggieri, Milizia, & Angeli, 1985), we observed that patients with different pathologies, like colitis ulcerosa dermatopathic pathology, etc., showed different styles in their experience of sexual pleasure during the phases, described by Masters and Johnson (1968), of the sexual sequence (excitation, plateau, orgasm, and resolution). In this research we observed also that some differences in the intensity of pleasure were linked to lack of perception of tension in some body parts. The hypothesized mechanism linked the lack of pleasurable tension with muscular contractions. Now the question is how the muscular inhibitory mechanisms could contribute to the development of pathology. To answer this question a particular form of reflex mechanism, called "somato-visceral reflex," was considered (Ruggieri, 1988).

Actually, the most studied reflexes are (1) the somatosomatic: the receptor and effector are placed in the muscles, i.e., the contraction of the *quadriceps* is evoked by the stimulation of the same muscle, and (2) viscerovisceral reflexes like pupillary reflexes, gastric reflex, etc. Few studies of somatovisceral reflexes which have the starter (the receptor) in the muscles or in the skin and the effectors in the internal organs. The muscular activity is not only signaled by the cortical areas of the nervous system but produces also, through reflex pathways, modification in the activity of internal organs. For example, elevated muscular activity could modify the blood circulation of an internal organ or an increase in contraction of musculature. If an increase in activity of the somatic musculature is chronic, a possible chronic modification of the internal organs could represent a "ground" favouring pathology.

In the present research we apply this concept to a specific form of pathology, in particular to the uterine fibrome. The hypothesis is that women with this form of pathology (1) habitually control and inhibit pleasure felt

during sexual experience through a chronic increase of muscular activity, (2) this muscular activity, through somatovisceral reflexes, produces some chronic modification in the activity of the uterus, and (3) the changes in the uterus, interacting with other physiopathological components, i.e., hormones, contribute to the genesis of an uterine fibroma. In this work we did not study the internal motivational factors that induce subjects to the inhibition of pleasure but rather how they do it.

METHOD

Subjects

The experimental group was composed of 17 women between 40 and 50 years and affected by uterine fibroma. They frequented the Gynecologic and Obstetric Department of San Giacomo Hospital of Rome. The patients were asked to participate as volunteers in research on the psychophysiological aspects that could involve pathology. The diagnosis of uterine fibromatosis was made clinically and ecographically. The control group was composed of 14 women who visited the same hospital for medical preventive controls. They did not show any form of pathology. They were asked to participate as volunteers in a research on psychophysiological aspects that might underlie illness.

Apparatus and Procedure

Muscular tone at rest of the muscle rectus of the abdomen was measured by electromyographic equipment constructed in the laboratory. EMG potentials passed through an amplifier using a band pass between 20 and 1000 Hz. The EMG signal was sent to an integration system which performed the analysis of amplitude. The signal was digitized in 10-sec. periods that appeared on a display. The surface electrodes of 14 mm diameter, covered with a conductor paste, were applied to the abdomen of a prone subject at three different points: 1 cm just below the xyphoid apophysis, 1 cm above the umbilicus, and 2 cm over the pubic symphysis. For each point was calculated the mean value of 12 measurements each of 10 sec. duration. For the evaluation of the intensity of pleasure habitually felt during the sexual behavior we, following Masters and Johnson (1968), considered the sexual sequence as composed of four phases, namely, excitation, plateau, orgasm, and resolution. For each phase subjects indicated on a 10-point scale the amount of pleasure habitually felt, 0 corresponding to "lack of pleasure" and 10 the maximum possible.

RESULTS AND DISCUSSION

Mean myographic scores of the three examined points of the rectus muscle of the abdomen for the experimental and control groups are indicated in Table 1. The group of patients with uterine fibroma presented a

TABLE 1
 MEANS AND STANDARD DEVIATIONS OF MYOGRAPHIC SCORES FOR 12 10-SEC. MEASURES
 (AMPLITUDE) IN ARBITRARY UNITS FOR "RECTUS" MUSCLE OF ABDOMEN AT
 THREE LEVELS AND STUDENT *t* FOR INDEPENDENT MEANS

Abdominal Muscle Rectus	Patient Group		Control Group		Student <i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Superior Portion	1.51	0.68	1.12	1.21	2.28	<.05
Medial Portion	1.13	0.53	0.74	0.74	2.87	<.05
Inferior Portion	1.61	0.46	0.80	0.80	6.65	<.001

mean myographic score statistically significantly higher than that of the control group by Student *t* for independent measures. The patients presented the highest myographic scores at the point located over the pubic symphysis.

In Table 2 are the mean self-report ratings for subjective pleasure habitually felt during each of the four phases of the sexual sequence of the two examined groups. As we can see, patients with uterine fibroma declared for each phase an amount of pleasure significantly lower with respect to those of the control group, the difference being statistically significant.

TABLE 2
 MEANS AND STANDARD DEVIATIONS OF SELF-REPORTED PLEASURE HABITUALLY FELT DURING FOUR
 PHASES OF MASTERS AND JOHNSON'S SEXUAL SEQUENCE AND STUDENT *t* FOR INDEPENDENT MEANS

Group	Excitation		Plateau		Orgasm		Resolution	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Patients	4.4	2.2	4.9	2.4	5.5	2.5	4.2	3.0
Control	6.0	1.9	7.6	1.2	8.4	2.1	6.6	2.3
Student <i>t</i>	-2.2		-3.6		-3.7		-2.7	
<i>p</i>	.003		.001		.0008		.01	

Our results indicate that women with uterine fibroma have significantly higher mean myographic scores on the rectus muscle of the abdomen than "normal" women and lower subjective feelings of pleasure during the phases of the sexual sequence.

As indicated in the introduction, we hypothesized that both results are related and contribute together to the pathogenesis of the uterine fibroma. We interpret the high myographic scores of the patients as related to an active inhibitory mechanism produced by the patients to reduce the subjective feeling of pleasure. This hypothesized inhibitory control of pleasurable experience could be considered a stable attitude of these patients. This interpretation is coherent with our physiological model of inhibition of emotion (Ruggieri, 1988). In fact, it was hypothesized that an important component of subjective feeling of pleasure was represented by an increased muscular tone in the direction of an isometric contraction and that the mechanisms of

inhibition act on the muscular activity with further increase in tone followed by chronic contracture (muscular contraction not followed by relaxation). The rationale for this hypothesis was that muscular contracture could act through a feedback mechanism on the encephalic centers (hypothalamus, etc.) that program and modulate instinctual and emotional activities. The muscular contracture represents from this point of view the highest possible activity which assumes the role of a stop signal. The second hypothesis suggests that the chronic contraction of the rectus of the abdomen represents the basis of a chronically activated reflex pathway starting in the muscle and ending in the internal organ (somatovisceral reflex) (Johansson, 1962; Kaizumi & Brooks, 1967).

If the inhibitory control of emotion is chronic, the internal organ (uterus) would be continuously stressed through this reflex pathway. This process could be the ground for developing pathology when other pathogenic variables, i.e., hormonal alterations, are also present. It is also possible that subjects produce simultaneously an increase in activity of both somatic and uterine musculature. Our model is easily linked with other psychological models that study why subjects inhibit the experience of pleasure. Now we are interested in studying how they do it. We consider our results as first observations that need further investigation.

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